FURUNO

SERVICE MANUAL

U-AIS Transponder

MODEL FA-150

Addition

Appendix 6. INLAND AIS
FA-1501: Ver.02.02 or more/FA-1502: Ver.02.01 or more
(For INLAND AIS and ITU-R M 1371-3 specifications)

Chapter 3. System Setting
Note: Special characters: $ * , ! ^ ~

Important;

This manual is intended for use by authorized FURUNO service technicians for the installation of this equipment.
Under no circumstances should the contents of this manual be released to the user.

FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

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(NAYO) FA-150

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FURUNO

No.: FQ4-2006-006

Date: 2006-04

Information

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Addenda No.1 to FA-150 Service Manual, Pub. No.44310

FA-150
Auto Target Sort

New Software

The latest software for FA-150 is available on Technet.

Unit	Current Program Number.	Previous version
FA-1501	2450018-**01.06**	01.05
FA-1502	2450021.**01.05**	01.04

Change to be made

1) Auto target sort function for target and dangerous lists added in User Settings menu.

[USER SETTINGS]
KEY BEEP : ON
ALARM BUZZER : ON
DISP RCVD MSG : ALL
RCVD MSG BUZZ : ON
LR MODE : AUTO
AUTO SORT : ON
CPA/TCPA ALARM

④

NAV

The target list is sorted by range and the dangerous list by TCPA. The list is sorted automatically if no key operation is made on the list for 30 seconds, and then every 5 seconds. "NOW SORTING" message appears only when the list is operated with DISP, >, and < keys.

2) Dynamic information, "Aground" and "Not Under Command" added to Class A AIS

3) Target lost time for Class B AIS changed (The lost target is calculated by FA-1502.)

Speed	Lost time (New software)	Lost time (Old software)
14 to 23 knots	150 seconds	75 seconds
More than 23 knots	150 seconds	20 seconds

4) Regional operations improved

a) Making the correction on distance calculation to the region
b) Removing problem that the area cannot be registered in some cases
c) Removing problem that the system does not transmit after passing through the RX area

Factory-modification

From June 2006 (scheduled)

FURUNO

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Addenda No. 2 to FA-150 Service Manual, Pub. No. SME-44310

FA-150

Draught data for Other Ships

- Monitor Program: V01.06 -

"Draught" data is added to page 5/6 of DETAILS SHIP display as below.
To show the draught data, press DISP, TARGET LIST, and ENT, and then select page 5/6 of DETAILS SHIP.

```
[DETAILS SHIP]          5/6
MMSI[A]   : xxxxxxxxx
DRAUGHT : x.x m
NAVSTATUS : 0
*** STATUS DETAIL ***
UNDER WAY USING
```

④
NAV

The current programs are;

CPU program (FA-1501): 2450018-01.06
Monitor program (FA-1502): 2450021-01.06 (changed from V01.05)

Important!

Monitor program V01.06 should be used with CPU program V01.05 or above.

Factory-modified sets

From the production in November 2006 (Scheduled)

FURUNO

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Addenda No.3 to FA-150 Service Manual, Pub. No.SME-44310

Revised
DIP switch setting corrected (07/2008)

FA-150
NavNet Connection and MARPOL Annex II compliant

New Software

Software is updated as follows. The operator's manual revised for the current software is F version.

FA-1501 Transponder Unit:	2450018-01.06 -> **01.09**
FA-1502 Monitor Unit:	2450021-01.06 -> **01.07**

④
NAV

Change to be made

(1) Supporting NavNet vx2 and NavNet 3D connections
Details follow on the next page.

(2) Receiving AIS messages, or CSTDMA data from the class B AIS transponder
Note) FA-30/50 receives both SOTDMA and CSTDMA messages.

(3) Complying with the revised MARPOL Annex II, Resolution MEPC.118 (52)
Categories A/B/C and D are changed to X, Y, Z and "Other Substances (OS)" categories.
Related menu is NAV STSTUS menu > CARGO TYPE & CREW > TYPE DETAIL.

Software is downloadable from the Technet.

Factory-modifies set
From June 2008 (scheduled)

Connection to NavNet vx2 and 3D

To connect FA-150 to NavNet vx2 and 3D via LAN, software update and change of DIP switch setting are required. The AIS requires NET-100 board, 03P9332.

Software: V01.09 (FA-1501) and V01.07 (FA-1502) or above

DIP Switch, #4 of S3 on MAIN board: OFF

S3	Position	Remarks
#1 to #3	OFF	Not used
#4	~~OFF~~ **ON**	For PC connection
	~~ON~~ **OFF**	For NavNet vx2 and 3D connection

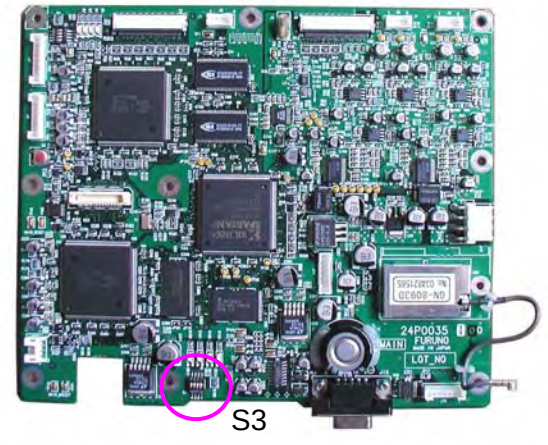

Fig.1 S2 on MAIN board, 24P0035

SET LAN PORT menu

Figs.2 and 3 show SET LAN PORT menu for NavNet connection with #4 of S3 set to OFF position. Items in bold are setup on each FA-150 and other items remain unchanged.

[SET LAN PORT] 1/2
IP ADDRESS
172.031.024.001
SUB NET MASK
255.255.000.000
PORT No.: 10000

Fig.2 SET LAN PORT (1/2) for NavNet connection

[SET LAN PORT] 2/2
GATEWAY ADDRESS
000.000.000.000
HOST NAME: AIS0
AIS0OUTPUT: CONTINUOUS
GPSOUTPUT: AUTO
ZDAOUTPUT: AUTO

Fig.3 SET LAN PORT (2/2) for NavNet connection

Fig.4 shows the original menu for PC connection.

[SET LAN PORT]
MODE: DISABLE
IP ADDRESS
172.031.024.001
SUB NET MASK
255.255.000.000
PORT No.: 10000
QUIT [MENU]

Fig. 4 SET LAN PORT menu for PC connection

FURUNO

Information

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Addenda No.12 to FA-100 Service Manual, Pub. No.SME-44170
Addenda No.4 to FA-150 Service Manual, Pub. No.SME-44310

FA-100/150
Configuration and Test Report Form

Attached is the Furuno AIS configuration and test report form which complies with IMO SN/Circ.227 and MSC.1/Circ.1252.

IMO SN/Circ.227: GUIDELINES FOR THE INSTALLATION OF A SHIPBORNE AUTOMATIC IDENTIFICATION SYSTEM (AIS)

MSC.1/Circ.1252: GUIDELINES ON ANNUAL TESTING OF THE AUTOMATIC IDENTIFICATION SYSTEM (AIS)

The form includes;

1) Automatic Identification System (AIS) Test Report, and
2) Attachments
   (a) AIS Initial Setting List
   (b) Measurements
   (c) Interconnection Diagram
   (d) Antenna Layout

The installation testing and initial installation configuration report are made by using 1) AIS test report and 2) Attachments. The annual testing is recorded on the first three pages, including cover. That is, the annual performance test does not use 2) Attachments.

The AIS test and configuration reports are requested to be kept on board.

④
NAV

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AIS Test Report

Model: FA-150 FA-100
Serial Number:_____

Name of ship:_____

The AIS has been tested according to IMO SN/Circ.227 and resolution MSC.74(69), annex 3

Contents

AUTO MATIC IDENTIFICATION SYSTEM (AIS) TEST REPORT

Attachments

1. AIS Initial Setting List
2. Measurements
3. Interconnection Diagram
4. Antenna Lay out

AUTO MATIC IDENTIFICATION SYSTEM (AIS) TEST REPORT

Name of ship/call sign:	
MMSI number:	
Port of registry:	
IMO Number:	
Gross tonnage:	
Date keel laid:	

1. Installation details		
	Item	**Status**
1.1	AIS transponder type:	
1.2	Type approval certificate	
1.3	Initial installation configuration report on board?	
1.4	Drawings provided? (Antenna-, AIS-arrangement and block diagram)	
1.5	Main source of electrical power,	
1.6	Emergency source of electrical power,	
1.7	Capacity to be verified if the AIS is connected to a battery	
1.8	Pilot plug near pilots operating position?	
1.9	120 V AC provided near pilot plug? (Panama and St. Lawrence requirement)	

2. AIS programming . Static information		
2.1	MMSI number	
2.2	IMO number	
2.3	Radio call sign	
2.4	Name of ship	
2.5	Type of ship	
2.6	Ship length and beam	
2.7	Location of GPS antenna	

3. AIS programming . Dynamic information		
3.1	Ships position with accuracy and integrity status (Source: GNSS)	
3.2	Time in UTC (Source: GNSS)	
3.3	Course over ground (COG) (will fluctuate at dockside) (Source GNSS)	
3.4	Speed over ground (SOG) (zero at dockside) (Source: GNSS)	
3.5	Heading (Source: Gyro)	
3.6	Navigational status	
3.7	Rate of turn, where available (ROT)	
3.8	Angle of heel, pitch and roll, where available	

4. AIS programming . voyage related information		
4.1	Ships draught	
4.2	Type of cargo	
4.3	Destination and ETA (at masters discretion)	
4.4	Route plan (optional)	
4.5	Short safety-related messages	

5. Performance test using measuring instrument		
5.1	Frequency measurements AIS ch. 1 and 2, GMDSS ch. 70	
5.2	Transmitting output, AIS ch. 1 and 2, GMDSS ch. 70	
5.3	Polling information ch. 70	
5.4	Read data from AIS	
5.5	Send data to AIS	
5.6	Check AIS response to virtual vessels.	

6. On air. performance test		
6.1	Check reception performance	
6.2	Confirm reception of own signal from other ship/VTS	
6.3	Polling by VTS/shore installation	

Electromagnetic interference from AIS observed to other installations?:

Remarks:

The AIS has been tested according to IMO SN/Circ.227 and resolution MSC.74(69), annex 3		
Name of Radio Inspector	Date and place	Name of Radio Inspector Company

This Test Report is in accordance with MSC.1/Circ. 1252

1. AIS Initial Setting List (FA-100)

Setting Item	Setting
MMSI	
IMO	

Setting Item			Setting
5.INIT SETTINGS	1.SET SHIP DATA	NAME	
		C.SIGN	
		DRAUGHT	
		DTE	DEFAULT / KEY & DISP
	2.SET DESTINATION	DATE	
		TIME	
		DESTINATION	
	3.SET NAV STATUS	NAV STATUS	
	4.SET TYPE&CREW	CREW	
		TYPE CLASS	A / B
		TYPE NO.	
	5.SET CPA/TCPA	CPA	
		TCPA	
		ACTV	ENBL / DSBL
	6.SET ANNTENA POS	1. INTERNAL ANT POS	A: B: C: D:
		2. EXTERNAL ANT POS	A: B: C: D:

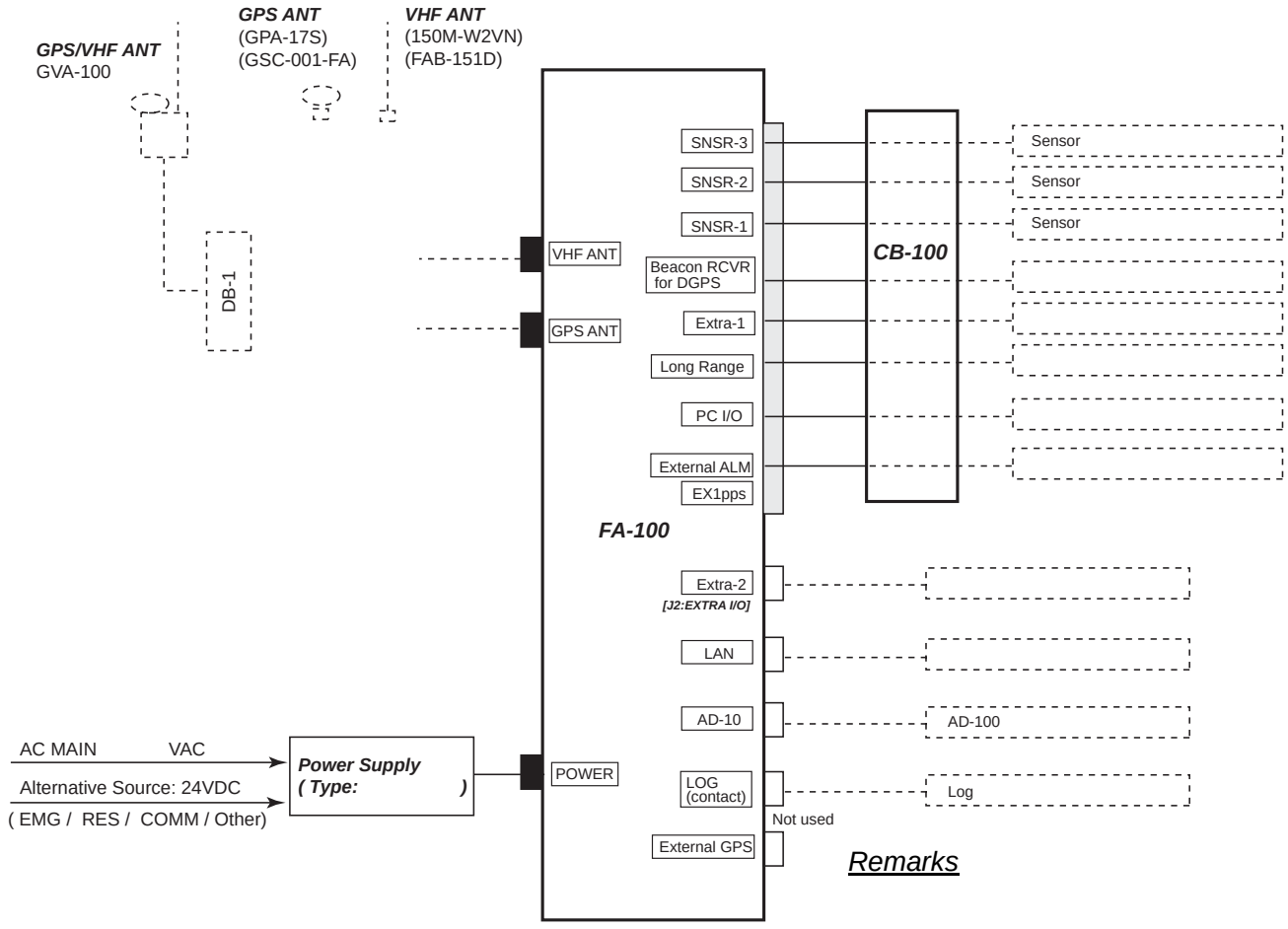
Setting Item				Setting			
6. SYSTEM SETTING	1. SET I/O PORT	2.I/O FUNCTION	PC I/O	4800bps / 38.4kbps			
			SNSR1	4800bps / 38.4kbps			
			SNSR2	4800bps / 38.4kbps			
			SNSR3	4800bps / 38.4kbps			
			LR	4800bps / 38.4kbps			
			BEACON	4800bps / 38.4kbps			
			EXTRA1	4800bps / 38.4kbps			
			XTRA I/O	4800bps / 38.4kbps			
			PORT LR	LR / EXTDISP			
		3.I/O PRIORITY	1.L/L COG SOG	SN1: SN2: SN3: EX1: LR: PC: LAN:			
			2.HDG	SN1: SN2: SN3: EX1: LR: PC: LAN:			
			3.ROT	SN1: SN2: SN3: EX1: LR: PC: LAN:			
			4. AIS	RESPONSE	PC/LAN /NONE / EX1 / LR		
				EX1	DSBL / ENBL		
				LR	DSBL / ENBL		
				PC	DSBL / ENBL		
				LAN	DSBL / ENBL		
		4.SET LAN (IP ADDR)	IP ADR	000-000-000-000 ->			
			SUB NET MASK	000-000-000-000 ->			
			PORT NO	1000 ->			
	2.SET CHANNEL	1.VIEW CHANNL	POWER	W			
			CHANNEL NO.	CH-A:		CH-B:	
		2.CHANNEL EDIT	TIME				
			FROM				
			POWER				
			CH NO.				
			MODE				
			ZONE				
			CH AREA				
	3.SET LR MODE	LR MODE		AUTO / MANUAL			
	4.SET OTHER I/O	AD-10		DSBL / ENBL			
		ROT		sec			
	5.SET BUZZER	ALARM		ON / OFF			
		CPA/TCPA		ON / OFF			
		MSG ALM		ON / OFF			

Program Number	Version
MAIN	245 - 0001 - -
SUB	245 - 0002 - -
H8S1	245 - 0003 - -
H8S2	245 - 0004 - -
H8S3	245 - 0005 - -

2. Measurements (FA-100)

Checking Items	Result		
Source of energy	☐ Main ☐ Emergency ☐ Reserve		
Pilot plug arrangement	☐ N/A ☐ Yes		
Static information	Good ☐ (Ship name, MMSI, Callsign, Type of Vessel, etc)		
Dynamic information	Good ☐ (Time, Pos, SOG, COG, Heading, Nav status, etc)		
Voyage related information	Good ☐ (Draft, Type of cargo, etc)		
Alarm test	Good ☐		
Self-check (built - in) test	Good ☐		
Operation test (if applicable)	Good ☐		
Operation & Maintenance Manual	Good ☐		
Transmitter Power and Frequency error	161.975 MHz (AIS-1:Ch87)	162.025 MHz (AIS-2:Ch88))	156.525 MHz (Ch70)
	±20 %: / / W	±20 %: / / W	±20 %: / / W
	±3 ppm: Hz	±3 ppm: Hz	±3 ppm: Hz

3. Interconnection Diagram (FA-100)



Reported by: _____

Date: / /

1. AIS Initial Setting List (FA-150)

Setting Item				Setting
MMSI			MMSI	
			IMO#	00
			NAME	
			C.SIN	
SET INT ANT POS			A, B, C, D	A: B: C: D:
SET EXT ANT POS			A, B, C, D	A: B: C: D:
SET SHIP TYPE			10 -- 90	Ex; 70 (Cargo ship)
SET I/O PORT	SET COM PORT	COM 1	MODE	LONG RANGE / EXT DISPLAY
			SPEED	IEC61162-1 / IEC61162-2
		COM 2	MODE	EXT DISPLAY / MONITOR / HI LEVEL IF
			SPEED	IEC61162-1 / IEC61162-2
		COM 3	MODE	EXT DISPLAY / MONITOR / HI LEVEL IF
			SPEED	IEC61162-1 / IEC61162-2
		COM 4	SENSOR	SENSOR
			SPEED	IEC61162-1 / IEC61162-2
		COM 5	SENSOR	SENSOR
			SPEED	IEC61162-1 / IEC61162-2
		COM 6	SENSOR	SENSOR
			SPEED	IEC61162-1 / IEC61162-2 / AD10
	SET PC PORT		MODE	STANDARD / MONITOR / SEFRVICE / BEACON
			SPEED	4800 / 9600 / 19.2k / 38.4k / 54.7k
	SET LAN PORT		MODE	STANDARD / MONITOR / SEFRVICE
			IP ADDRESS	IP ADDRESS: 172.031.024.001 Changed: SUBNET MASK: 255.255.000.000 Changed: PORT No. 10000 Changed:
	SET PRIORTY	L/L SOG, COG	COM 4, 5, 6 -> 1, 2, 3	Default
		HDG		
		ROT		

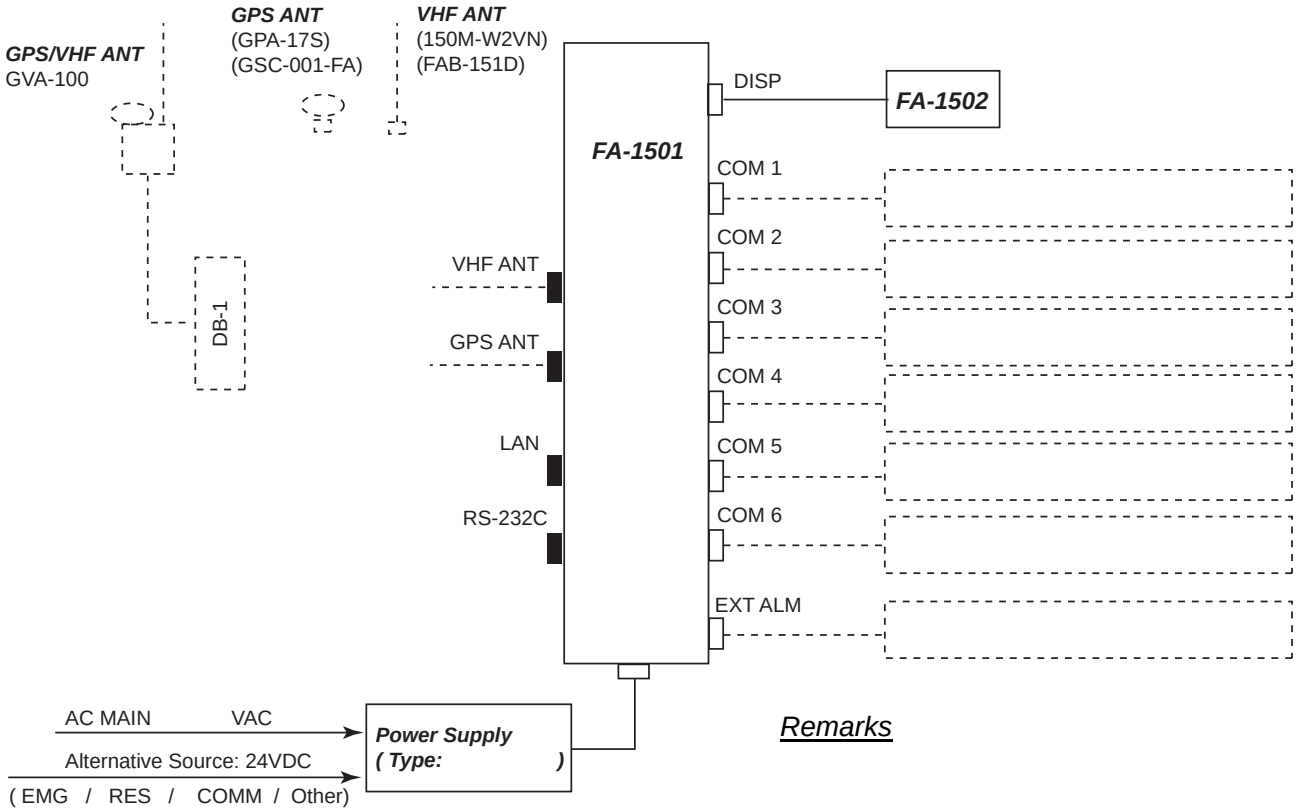
Program Version

FA-1501: 2450018-01.____ FA-1502: 2450021-01.____

2. Measurements (FA-150)

Checking Items	Result		
Source of energy	☐ Main ☐ Emergency ☐ Reserve		
Pilot plug arrangement	☐ N/A ☐ Yes		
Static information	Good ☐ (Ship name, MMSI, Callsign, Type of Vessel, etc)		
Dynamic information	Good ☐ (Time, Pos, SOG, COG, Heading, Nav status, etc)		
Voyage related information	Good ☐ (Draft, Type of cargo, etc)		
Alarm test	Good ☐		
Self-check (built - in) test	Good ☐		
Operation test (if applicable)	Good ☐		
Operation & Maintenance Manual	Good ☐		
Transmitter Power and Frequency error	161.975 MHz (AIS-1:Ch87)	162.025 MHz (AIS-2:Ch88))	156.525 MHz (Ch70)
	±20 %: / / W	±20 %: / / W	±20 %: / / W
	±3 ppm: Hz	±3 ppm: Hz	±3 ppm: Hz

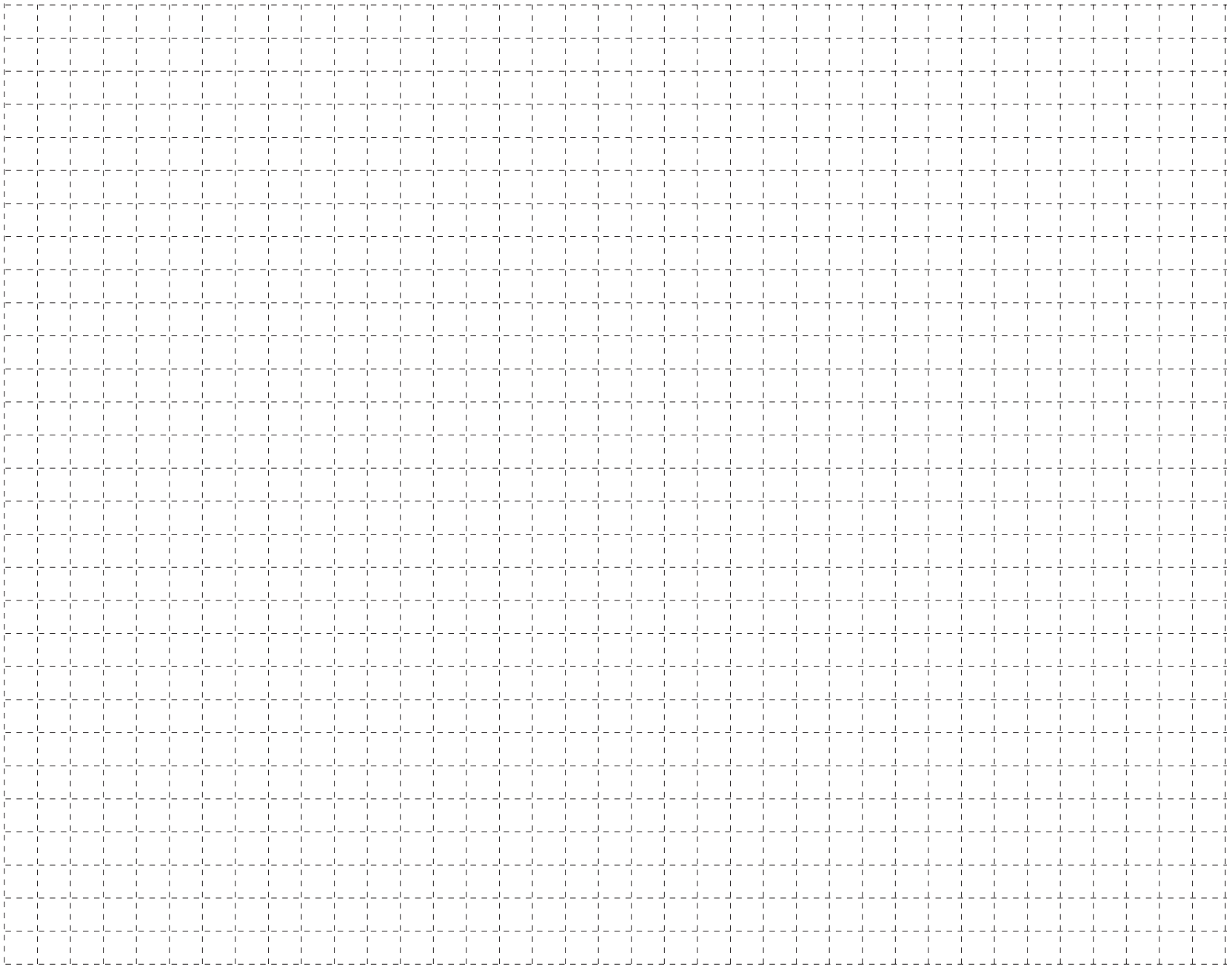
3. Interconnection Diagram (FA-150)



4. Antenna Lay out

Grid Scale: m

No.	Antenna
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	



4. Antenna Lay out

Grid Scale: m

No.	Antenna
1	
2	
3	
4	
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7	
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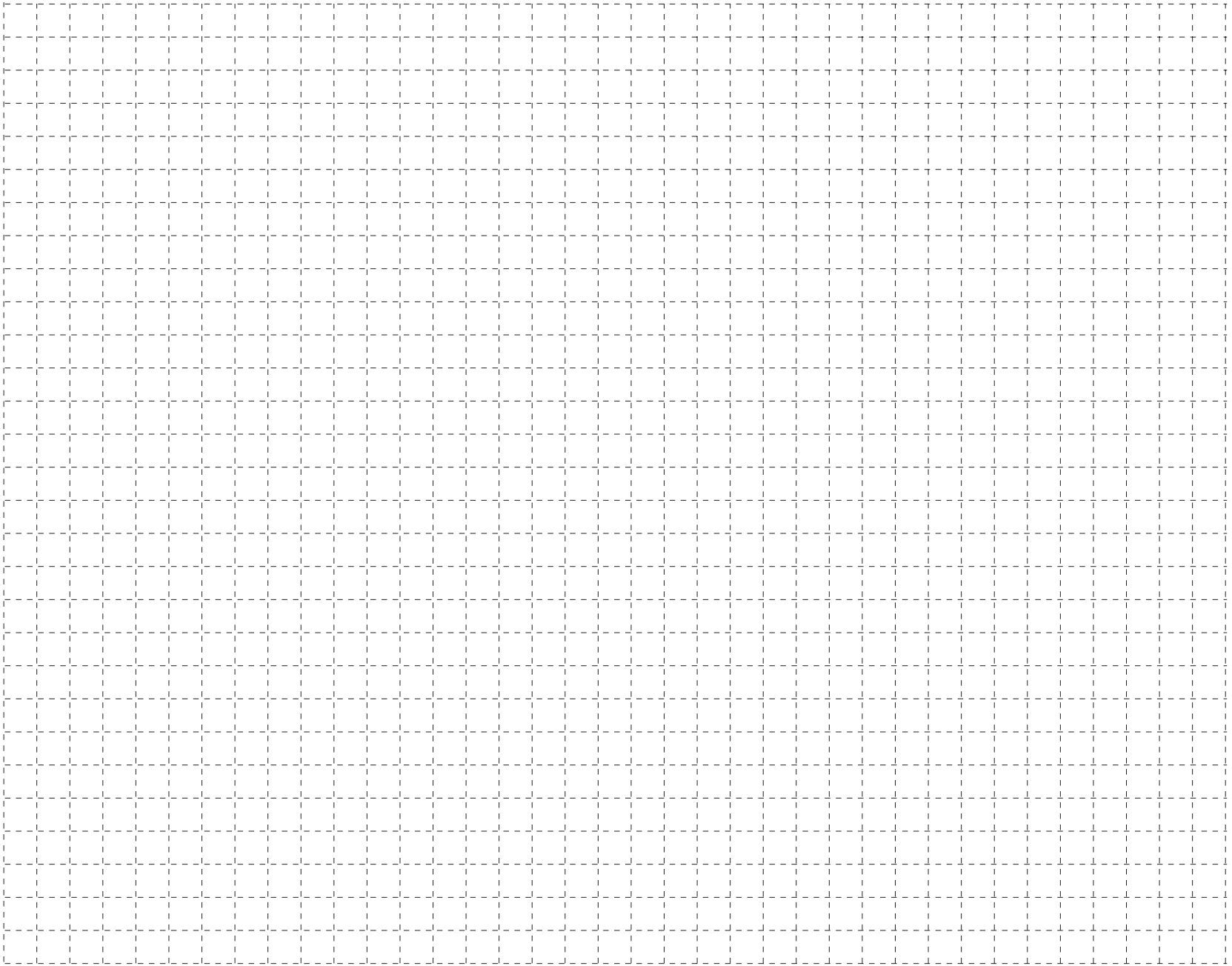
24	



FURUNO

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Addenda No. 5 to FA-150 Service Manual, Pub. No. SME-44310

FA-30/50/100/150
Connection to NavNet vx2

The FA-150 service manual describes that the FA-150 is connected to NavNet vx2 series in "High level interface" mode, but after updating NavNet vx2 series to V01.08, the FA-150 is connected to NavNet vx2 series in EXT DISPLAY mode.

Use the table below to connect FA-150 to NavNet vx2 series.

Table 1 Connection of FA-150 to NavNet vx2

NavNet vx2 software	Mode setting on FA-150	Speed setting on FA-150	IF-1500AIS
V1.07 and before	HI LEVEL IF	IEC-61162-2 (38.4k)	Not necessary
V1.08 and after	**EXT DISPLAY**	IEC-61162-2 (38.4k)	Not necessary

④
NAV

Pages related to NavNet vx2 connection in the FA-150 service manual are 1-6, 3-7, 3-12, and 9-5.

Currently, FA-30/50/100 and most AIS of other make are connected to NavNet vx2 without the interface unit.

Table 2 Connection of FA-30/50/100 to NavNet vx2

Type of AIS	NavNet vx2 software	IF-1500AIS
FA-30/50/100	V1.07 and before	Necessary
	V1.08 and after	**Not necessary**

Related Furuno Information: FQ3-2006-014

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1. Operating voltage of Power unit: PR-240 (See page 3-29.)

Operating voltage of the PR-240 is jumper-selectable to 115 VAC or 230 VAC (factory-default: 230 VAC). Check the jumper setting on the PR-240.
** The AIS is required alternative source, for example emergency source. **

2. Have you waterproofed Antenna?

3. Have you set the output sentence of GPS?

Set the output sentence of GPS. FA-150 accepts sentences of IEC61162 (NMEA Ver. 2.0 or higher). In addition, set the sentence transmission interval of GPS to 1 second. In the event that IEC61162 data is not inputted for more than 5 seconds, AIS outputs an error message.

Equipment		**Acceptable sentence and priority**	**Example**
GPS	Position	GNS>GLL>GGA>**RMC**	**RMC** GNS, GLL GGA, VTG
	Speed Over Ground	*VBW*[Note1)]>**RMC**>VTG>*OSD*[Note1)]	
	Course Over Ground	**RMC**>VTG>*OSD*[Note1)]	
	Land surveying	DTM	DTM (WGS-84)
	RAIM	GBS	
Gyro		HDT>*OSD*[Note1)]>AD format	HDT
Rate of Ture indicator		$TI ROT> Calculated	$TI ROT

Note1 :
VBW is a sentence outputted from the speed and distance measuring devices and OSD from radar.

Note 2:
To be connected if $TI-ROT sentence is outputted from the ROT meter.

4. Check connection with the External equipment. (See page 3-6.)

Confirm the equipment to be connected.

- SENSOR: GPS, HDG, ROT
- EXT DISPLAY: RADAR, ECDIS
- MONITOR: additional FA-1502
- HI LEVEL IF: NAVNET 2

Port	**Equipment**					
COM 1			LONG RANGE	EXT DISPLAY		
COM 2				EXT DISPLAY	MONITOR	HI LEVEL IF
COM 3				EXT DISPLAY	MONITOR	HI LEVEL IF
COM 4	SENSOR			EXT DISPLAY		
COM 5	SENSOR					
COM 6	SENSOR	AD-10				

5. Carry out INITIAL SETTINGS. (See page 3-1.)

Carry out the settings of the table below.

<table>
<tr><th colspan="4">Set items</th><th>Setting</th></tr>
<tr><td colspan="3" rowspan="4">SET MMSI</td><td>MMSI</td><td></td></tr>
<tr><td>IMO #</td><td>00</td></tr>
<tr><td>NAME</td><td></td></tr>
<tr><td>C.SIN</td><td></td></tr>
<tr><td colspan="3">SET INT ANT POS.</td><td>A, B, C, D</td><td>A: B: C: D:</td></tr>
<tr><td colspan="3">SET EXT ANT POS.</td><td>A, B, C, D</td><td>A: B: C: D:</td></tr>
<tr><td colspan="3">SET SHIP TYPE</td><td>10 – 90</td><td>Ex) 70: Cargo</td></tr>
<tr><td rowspan="16">SET I/O PORT</td><td rowspan="12">SET COM PORT</td><td rowspan="2">COM 1</td><td>MODE</td><td>LONG RANGE/ EXT DISPLAY</td></tr>
<tr><td>SPEED</td><td>IEC61162-1/ IEC61162-2</td></tr>
<tr><td rowspan="2">COM 2</td><td>MODE</td><td>EXT DISPLAY/MONITOR/HI LEVEL IF</td></tr>
<tr><td>SPEED</td><td>IEC61162-1/ IEC61162-2</td></tr>
<tr><td rowspan="2">COM 3</td><td>MODE</td><td>EXT DISPLAY/MONITOR/HI LEVEL IF</td></tr>
<tr><td>SPEED</td><td>IEC61162-1/ IEC61162-2</td></tr>
<tr><td rowspan="2">COM 4</td><td>MODE</td><td>SENSOR/ EXT DISPLAY</td></tr>
<tr><td>SPEED</td><td>IEC61162-1/ IEC61162-2</td></tr>
<tr><td rowspan="2">COM 5</td><td>SENSOR</td><td>SENSOR</td></tr>
<tr><td>SPEED</td><td>IEC61162-1/ IEC61162-2</td></tr>
<tr><td rowspan="2">COM 6</td><td>SENSOR</td><td>SENSOR</td></tr>
<tr><td>SPEED</td><td>IEC61162-1/ IEC61162-2/AD10</td></tr>
<tr><td colspan="2" rowspan="2">SET PC PORT</td><td>MODE</td><td>STANDARD/MONITOR/SERVICE/BEACON</td></tr>
<tr><td>SPEED</td><td>4800/9600/19.2k/38.4k/57.6kbps</td></tr>
<tr><td colspan="2" rowspan="2">SET LAN PORT</td><td>MODE,</td><td>STANDARD/MONITOR/SERVICE</td></tr>
<tr><td>IP settings</td><td>IP ADDRESS: 172.031.024.001
SUBNET MASK: 255.255.000.000
PORT No: 10000</td></tr>
<tr><td rowspan="3">SET PRIORITY</td><td>L/L, COG, SOG</td><td rowspan="3">COM 4, 5, 6 -> 1, 2, 3</td><td rowspan="3">Default</td></tr>
<tr><td>HDG</td></tr>
<tr><td>ROT</td></tr>
</table>

- SENSOR SPEED: IEC61162-1(4800 bps)
- EXT DISPLAY, MONITOR, HI LEVEL IF SPEED: IEC61162-2(38.4 kbps)

6. Make sure no alarm is generated. (See page 8-2.)

If any alarm is detected, the generated alarm is displayed by popup display. In addition, the generated alarm list is displayed by [DISP] -> ALARM STATUS.

7. Confirm Program Ver. and carry out diagnostics. (See pages 6-3, 8-14 through 16.)

- Confirm program No. of FA-150 and diagnostics test.
  Execute [MENU] -> DIAGNOSTICS -> TRANSPONDER TEST -> MEMORY TEST.

FA-1501		FA-1502	
2450018-01.0x	( )	2450021-01.0x	( )

8. Make sure sensor input is automatically changed over.

Check the use condition by [MENU] -> SENSOR STATUS and confirm whether or not the GPS data is changed over by the following method.

- If the internal GPS is used presently;
  Disconnect GPS antenna connector of FA-1501.
- If the external GPS is used presently;
  Turn off the power supply of external GPS. It would take 30 seconds at maximum to change over data.

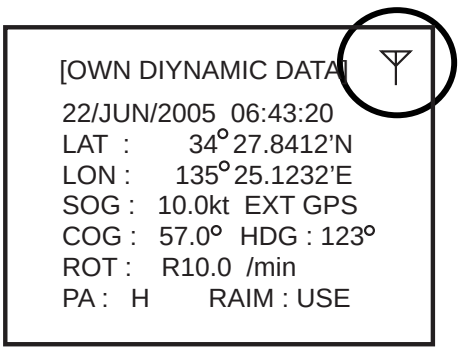
9. Make sure AIS target is received.

In [DISP] -> TARGET LIST, the list of ships whose data are received is displayed.

10. Make sure transmission is being carried out.

If the [DISP] -> OWN DYNAMIC DATA antenna mark blinks to the transmission interval while the reporting data is being transmitted, transmission is properly carried out. The antenna mark means the following:

- Antenna mark is displayed;
  It indicates that the system is being synchronized with UTC of built-in GPS. The antenna mark disappears if the system is not synchronized with the built-in GPS.
- Antenna mark blinks;
  The antenna mark blinks to the transmission interval.


[OWN DIYNAMIC DATA]
22/JUN/2005 06:43:20
LAT : 34° 27.8412'N
LON : 135° 25.1232'E
SOG : 10.0kt EXT GPS
COG : 57.0° HDG : 123°
ROT : R10.0 /min
PA : H RAIM : USE

11. Make sure AIS target is displayed on Radar and ECDIS.

12. Confirm Tx output power and transmission frequency. (See page 7-2.)

Confirm as required.
First of all, set transmission output and channels by [MENU] -> FOR SERVICE -> CH & PWR SETTINGS.
Then, confirm by [MENU] -> FOR SERVICE -> TX TEST.
Upon completion of this test, be sure to turn MODE of CH & PWR SETTINGS from MANUAL to AUTO.

Channel	Transmission output (±20 %)			Frequency tolerance (±3 ppm)
	12.5W	2W	1W	
CH 87(AIS)				161.975 MHz
CH 88(AIS)				162.025 MHz
CH 70(DSC)				156.525 MHz
CH				
CH				

13. Interference to VHF.

Check that FA-150 dose not interfere to No.1 and No.2 VHF R/T with the SQ set to off.
Note that the ship is at anchor, the transmission interval of AIS is 3 minutes.

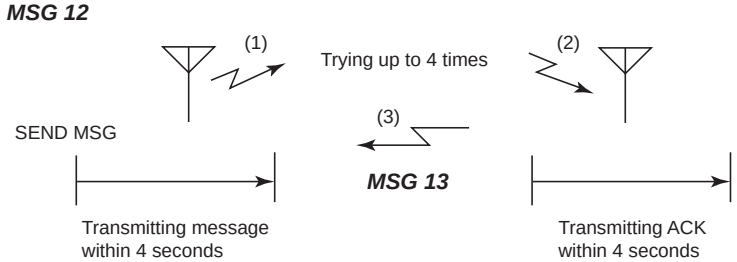
14. Carry out transmission and reception test of AIS message.

1. Carry out the following settings by [MENU]: -> MSG -> SET MSG TYPE.
   - ADDRESS TYPE : ADDRESS CAST
   - MMSI : Entry of MMSI
   - MSG TYPE : SAFETY
   - CHANNEL : BOTH

2. Create appropriate sentence by [MENU] -> MSG -> SET MSG.

3. Transmit the message by [MENU] -> MSG -> SEND MSG.

4. If the acknowledgment is received from the called station, popup display “SEND MESSAGE COMPLETE MMSI xxxxxxxxx” is given. If the acknowledgment from the called station is not received, popup display “SEND MESSAGE UNSUCCESSFUL MMSI xxxxxxxxx” is given. In this case that the message transmitted to the called station did not reach or the acknowledgment from the called station is not received.

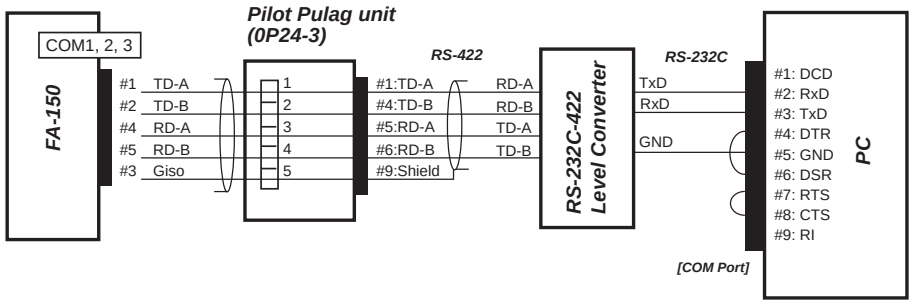


15. Confirm the operation of EXT ALM (See pages 8-2 and 3-22.)

Are EXT ALM signals correctly connected to the alarm system, etc.?
Make sure EXT ALM signal turns ON and alarm of the Alarm system is initiated when alarm is generated and for example, external GPS power supply is turned OFF.
In addition, make sure EXT ALM signal is turned OFF by ALM ACK signal from the Alarm system.

16. Check the Pilot plug.

Connect PC to the pilot plug unit as illustrated below.



Preparation

1. Confirm NAV STATUS by [DISP] -> NAV STATUS menu of FA-150. If default value 15: Not defined is displayed, set the value other than 15.

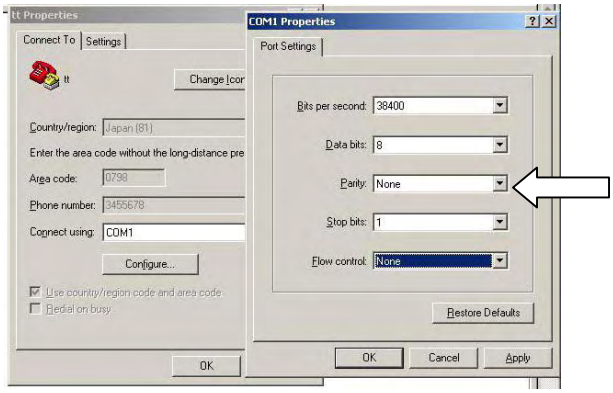
2. Set the pilot plug connection port.
   MODE: EXT DISPLAY, SPEED: IEC61162-2 (38.4 kbps)

3. Create the following sentence by “Ward pad, Note pad” etc. and prepare a text document. Be sure to feed line at the end of a sentence by pressing Enter.

   - Sentence to set NAV STATUS to “15: Not Defined.”
     $AIVSD,,,,,,,,15,*61 Enter
     $AIVSD,,,,,,,,15,*61 Enter

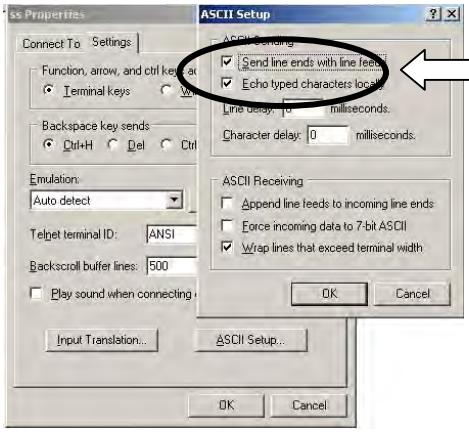
   - Sentence to send message “TEST MESSAGE” to MMSI:000000001 station by MSG12 through CH-A.
     $AIABM,1,1,0,000000001, 1, 12, D5CDP=5CC175,0*58 Enter

4. Boot the hyper terminal of PC and set the following.
   1) Choose [File] -> "Property," click Configure of [Connect To] tab menu, and carry out the following settings.



Bit/sec: 38400
Data bit: 8
Parity: none
Stop bit: 1
Flow control: none

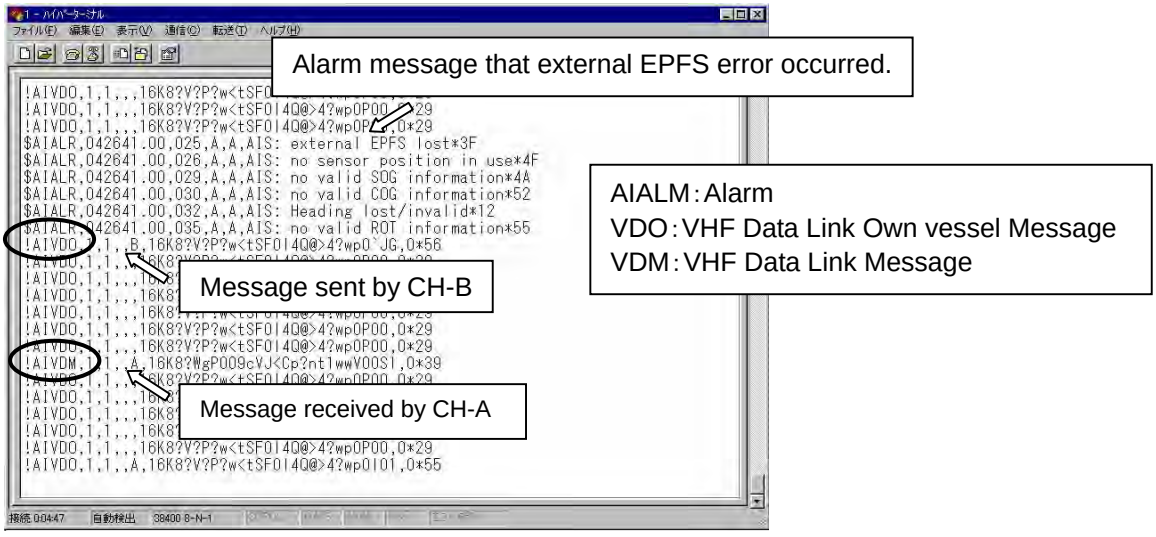
   2) Open [Settings] tab menu of "Property," click ASCII setting, and carry out the following settings.



Tick off "Send line ends with line feeds" and "Local Echo."

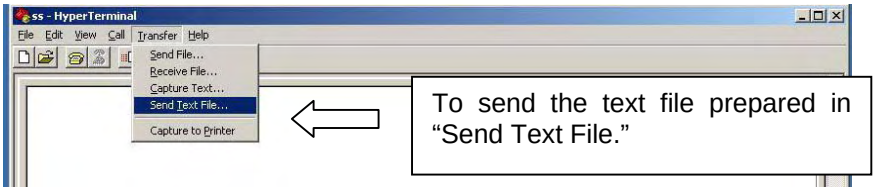
Confirmation of RD line

5. Upon completion of the above settings, display a sentence received from FA-150 on the hyper terminal screen.

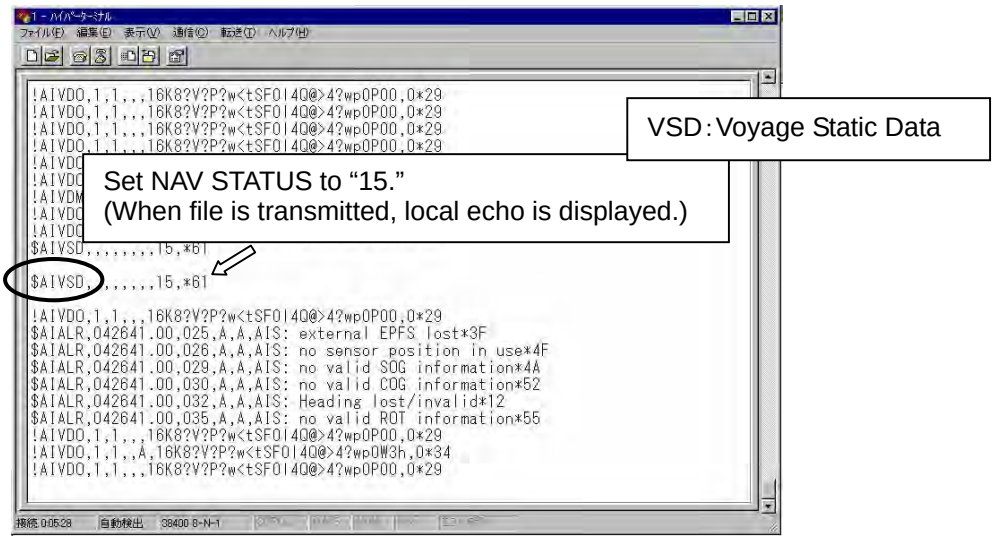

Alarm message that external EPFS error occurred.
!AIVDO,1,1,,,16K8?V?P?w<tSFOI4Q@>4?wpOPOO,0*29
$AIALR,042641.00,025,A,A,AIS: external EPFS lost*3F
$AIALR,042641.00,026,A,A,AIS: no sensor position in use*4F
$AIALR,042641.00,029,A,A,AIS: no valid SOG information*4A
$AIALR,042641.00,030,A,A,AIS: no valid COG information*52
$AIALR,042641.00,032,A,A,AIS: Heading lost/invalid*12
$AIALR,042641.00,035,A,A,AIS: no valid ROT information*55
!AIVDO,1,1,B,16K8?V?P?w<tSFOI4Q@>4?wp0`JG,0*56
Message sent by CH-B
!AIVDM,1,1,A,16K8?WgPOO9cVJ<Cp?ntlwwV0OSI,0*39
Message received by CH-A
AIALM : Alarm
VDO : VHF Data Link Own vessel Message
VDM : VHF Data Link Message

Confirmation of TD line

6. To confirm transmission, choose [TRANSFER] -> “Send Text File” and choose the text file of “NAV STATUS” prepared in step 3.



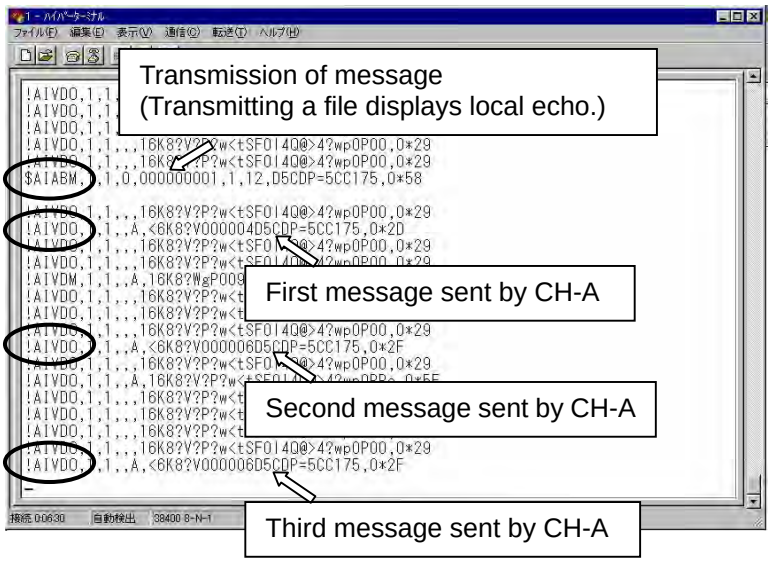
7. On the hyper terminal screen, the sentence: $AIVSD--- transmitted is displayed.



8. Make sure NAV STATUS is set from PC by FA-150.
   Make sure that “15: Not Defined” is set by [DISP] -> NAV STATUS of FA-150.
   Be sure to reinstate the NAV STATUS setting.

Transmission of test message

9. Send a message to a fictitious station by MSG.12. On the hyper terminal screen, the transmitted sentence: $AIVDO--- is displayed.


Transmission of message
(Transmitting a file displays local echo.)
First message sent by CH-A
Second message sent by CH-A
Third message sent by CH-A

10. Make sure whether or not the message was sent from PC.
    Open [MENU] -> MEG -> TX LOG and make sure the transmitted message “TEST MESSAGE” is recorded.

17. Have you done enough operational on FA-150 to user?

1) How to turn ON the power supply;
   There are two power switches: FA-1501 and FA-1502. In addition, explain the requirements to turn OFF the AIS power supply on the basis of A.917.
   (See page 8-17.)

2) Explanation of each item of [DISP] -> NAV STATUS and setting method.
   (See page 3-4.)

3) Since the ship’s name, call sign, and other static data are notified every 6 minutes, these pieces of data are not immediately displayed as is the case of position data.
   (See page 1-2.)

4) Settings of CPA/TCPA ALARM and RCVD MSG BUZZ of [MENU] -> USER SETTINGS menu. (See page 3-27.)

1.1 System overview

1.1.1 Automatic Identification System (AIS)

The FA-150 is a universal AIS (Automatic Identification System). It complies with IMO MSC.74(69) Annex 3, A.694, ITU-R M.1371-1 and DSC ITU-R M.825.
It also complies with IEC61993-2 (Type testing standard), IEC60945 (EMC and environmental conditions).
The AIS (Automatic Identification System) capable of exchanging data between own ship and other ships or coastal stations (VTS). The information obtained by AIS such as Ship names, MMSI, Call signs and other identification information, positional information, navigation information, etc. can improve the quality of information which the deck officer uses. By supplementing information obtained from Radar, AIS can contribute to avoiding of collisions between ships.

The system operates in three modes - autonomous (continuous operation in all areas), assigned (data transmission interval remotely controlled by authority in traffic monitoring service) and polled (in response to interrogation from a ship or authority).
It synchronized with GPS time to avoid conflict among multiple users (IMO minimum 2,000 is reports per minute and IEC requires 4,500 reports on two channels). The VHF channels 87B and 88B are commonly used and in addition there are local AIS frequencies. Ship-borne AIS transponders exchange various data as specified by the IMO and ITU on either frequency automatically set up by the frequency management telecommand received by the DSC receiver on ship.

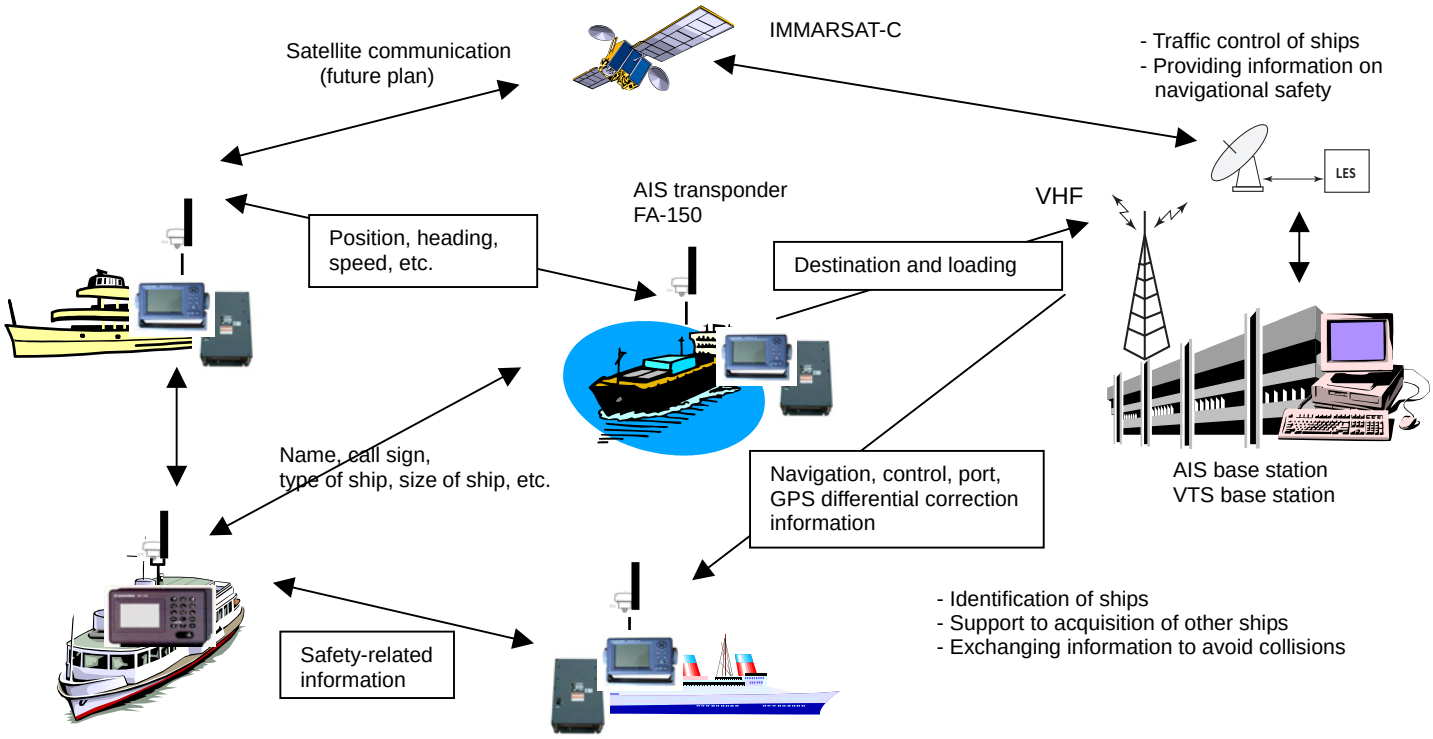


Fig. 1.1.1 AIS conceptual drawing

Dynamic data has the reporting (transmission) interval varied from 3 minutes to 2 seconds in accord with ship speed and course change. In addition, dynamic data is transmitted in response to requests of VTS or other ships.
Static data and voyage-related data are reported every 6 minutes or as requested.

Table 1.1.1 Information content

<table>
<tr><th>Dynamic data
(Msg. 1, 2, 3)</th><th>Static data
(Msg. 5)</th><th>Voyage-related data (Msg.5)</th><th>Voyage-safety related message</th></tr>
<tr><td>Position (WGS-84)</td><td>MMSI</td><td>Draught</td><td rowspan="8">Messages are freely prepared (as required)

Safety
Msg. 12, 14
Binary
Msg.6, 8</td></tr>
<tr><td>UTC</td><td>Call sign</td><td>Hazardous cargo</td></tr>
<tr><td>Positional accuracy</td><td>Ship’s name</td><td>Destination, ETA</td></tr>
<tr><td>SOG (Speed Over Ground)
COG (Course Over Ground)</td><td>IMO No.</td><td rowspan="4">Navigation status</td></tr>
<tr><td>Heading</td><td>Length and beam</td></tr>
<tr><td rowspan="2">Rate of turn</td><td>Type of ship</td></tr>
<tr><td>Location of position-fixing antenna on the ship</td></tr>
</table>

Table 1.1.2 Reporting interval of dynamic data

Ship’s navigation status	Reporting interval
Ship at anchor or moored, less than 3 knot	3 min.
Ship at anchor or moored, 3 knot or more	10 sec
0-14 knot speed	10 sec
0-14 knot speed with course change	3 1/3 sec
14-23 knot speed	6 sec
14-23 knot speed with course change	2 sec
Speed higher than 23 knot	2 sec
Speed higher than 23 knot, with course change	2 sec

Note:

- Changing course; When the heading data is changed more than 10 deg./min.
- The time for changing the report rate is as follows.
  When the ship’s speed is up; about 1 minute.
  When the ship’s speed is down; 3 to 4 minutes

1.1.2 System Operation

1. Operation of AIS

The AIS transponder uses 9.6 kbps Gaussian Minimum Shift Keying (GMSK) FM modulation over 25 or 12.5 kHz channels defined by ITU-R Rec. 1084-2 and Appendix S18 of RR, using HDLC (High-Level Data Link Control) packed protocols. Each station transmits and receives over two radio channels to avoid interference problems, and to be shifted without communications loss from other ships. These channels are allocated to the international channel and regional frequency.

- AIS1: 161.975 MHz (CH87B; 2087)
- AIS2: 162.025 MHz (CH88B; 2088)
- Regional frequency (156.025 MHz to 162.025 MHz)

The operation of regional frequency is assigned from 20 to 200 NM rectangle area. The operation on these channels is accomplished by the following means:

- VHF DSC (CH70) commands from shore-based AIS;
- TDMA (AIS message) commands from shore-based AIS;
  ** Refer to Message 22: Channel management **
- Commands from shipboard system such as ECDIS, etc. (ACA); and
- Manual inputs (PFEC).

Table 1.1.3 Link list

Parameter		Description
Regional frequencies (RR AP18)		156.025 MHz to 025 MHz
Channel spacing		12.5 kHz/25 kHz(used over international waters)
AIS1 CH87B: 2087		161.975 MHz
AIS2 CH88B: 2088		162.025 MHz
Bandwidth	Narrow (12.5 kHz)	Tx BT=0.3 Rx BT=0.3/0.5 (Modulation index = 0.25)
	Wide (25 kHz)	Tx BT=0.4 Rx BT=0.5 (Modulation index = 0.5)
Bit rate		9600 bps
Number of bits per 1 slot		256 bits
Modulation		GMSK (Gaussian Minimum Shift Keying)
Frequency tolerance		Within ±3 ppm
Transmission output power		12.5 W / 2W ± 20 %

BT: Bandwidth Time Product

AIS uses a TDMA (Time Division Multiple Access) technique synchronized with UTC. This technique uses a concept of frame, in which 1 frame is equal to 1 minute and is divided into 2,250 slots. With two channels, the communication capacity of 4,500 slots/minute is available.

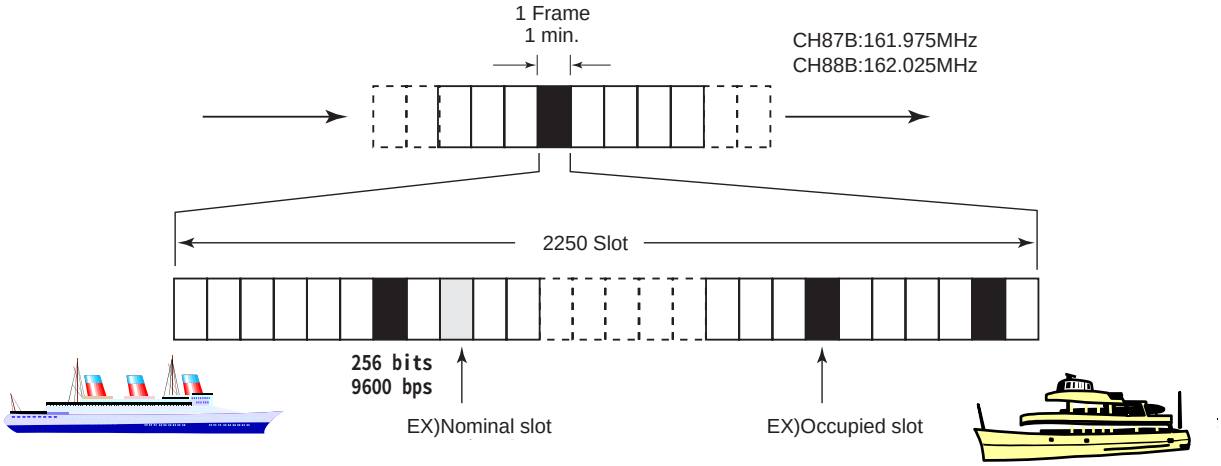


Fig. 1.1.2 AIS Concept of AIS slot

Data is transferred using a transmission packet as show in below. The packet should be sent from left to right. This structure is identical to the general HDLC structure, except for the training sequence. The total length of the default packet is 256 bits. This is equivalent to one slot.

Training Seq. 24 bits	Start flag 8 bits	Data(Long Tx Packets) 168 bit	FCS 16 bits	End flag 8 bits	Buffering 24 bits

Ramp up: 8 bits Total: 256 bits

2. Classification of AIS equipment

The AIS ship mobile station equipment is available with Class A and Class B. FA-150 is a type-approved “AIS Class A” .

- Class A:
  This is the equipment that complies with IMO AIS performance standard.

- Class B:
  This is the equipment that complies with IEC standard for ships in which AIS installation is not mandatory. The message report interval of dynamic data is 30 seconds and 3 minutes, while the message report interval of static data is 6 minutes.

1.2 Configuration

1.2.1 Configuration of FA-150

The FA-150 consists of VHF and GPS antennas, a transponder unit, a monitor unit, and several associated units.
The transponder contains a VHF transmitter, two TDMA receivers on two parallel VHF channels, a DSC channel 70 receiver, interface, communication processor, and internal GPS receiver.

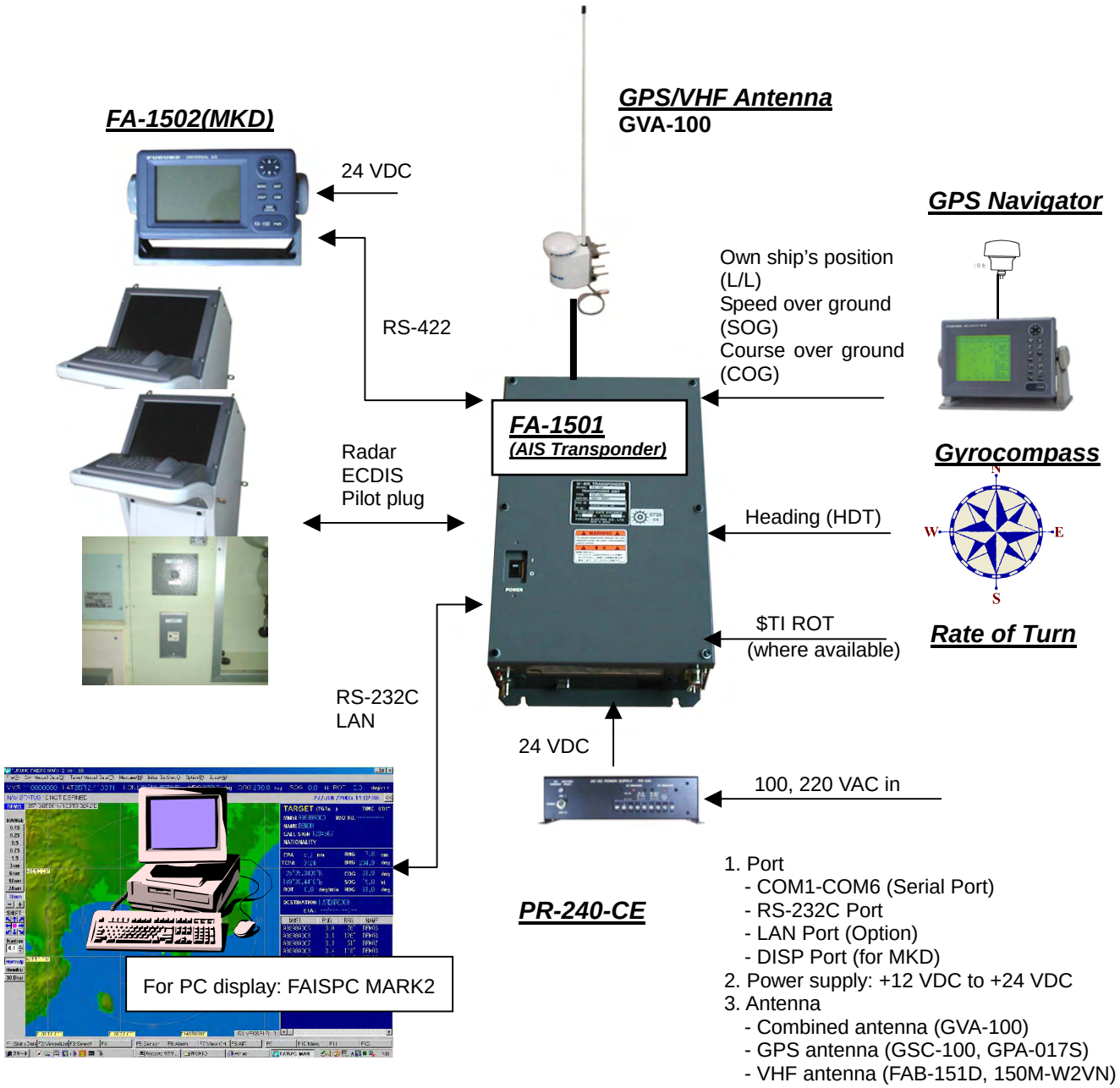


Fig. 1.2.1 Configuration of FA-150

1.2.2 Installations

1. Ports for serial I/O interface are six ports COM1 through COM6. All ports are supported with IEC61162-1 and 2 interfaces, in addition COM 4 to COM6 are supported with C.Loop interface. For sensor input ports are COM4, COM5, and COM6 ports.

2. Necessary sensors are own ship's position (L/L), speed over ground (SOG), course over ground (COG), and heading (HDT). If a rate of turn (ROT) indicator is available an IEC61162 interface, it should be connected to the AIS.

Data	Required	Optional
Reference datum	DTM	
Position information	GNS, GLL	GGA, RMC
SOG (Speed Over Ground)	VBW	VTG, OSD, RMC
COG (Course Over Ground)	RMC	VTG, OSD
Heading	HDT	OSD
RAIM (Receiver Autonomous Integrity Monitoring)	GBS	
ROT (Rate of Turn)	$TI ROT	

3. PC can be connected to PC port or LAN port.
   When PC is connected to LAN port, NET-100 board (option) should be mounted to FA-1501.

4. NAVNET 2 may be connected to FA-150 for AIS reception data display.
   NAVNET 2 should be connected to either COM2 or COM3 in FA-1501, and MODE and SPEED setting of connected COM port should be set to "HI LEVEL IF" and "IEC61162-2."

5. Maximum 2 sets of MKD (Minimum Keyboard and Display): FA-1502 can be connected. The second FA-1502 should be connected to either COM2 or COM3, and MODE and SPEED setting of connected COM port should be set to "MONITOR" and "IEC61162-2".

6. When PC is used for a display, PC version displays software: FAISPC MARK2 (Option) should be installed to PC. The PC version display cannot serve as a substitute for MKD (FA-1502), to which care should be taken.

7. For the antenna, combined antenna (GVA-100) or separate VHF antenna and GPS antenna can choose.

8. In order to reduce interference between VHF and AIS:
   1) The AIS VHF antenna should be installed safety away from interfering high-power energy sources like radar and other transmitting radio antenna, preferably at least 3 meters away from and out of the transmitting beam.
   2) Ideally there should no be more than one antenna on the same level. The AIS VHF antenna should be mounted directly above or below the ship's primary VHF radiotelephone antenna, with no horizontal separation and with a minimum of 2 m vertical separation. If it is located on the same level as other antennas, the distance apart should be at least 10 m.

   Reference:

   The AIS VHF antenna should be placed in an elevated position that is as free as possible with a minimum of 2 m in horizontal direction from constructions made of conductive materials. The antenna should not be installed close to any large vertical obstruction. The objective for the AIS VHF antenna is to see the horizon freely though 360 degrees.

9. The AIS and associated sensors should be powered from the ship's main source of electrical energy. In addition, it should be possible to operate the AIS and associated sensors from an alternative source of electrical energy.

10. The AIS should be installed to places where the ship is normal navigated and as well as where the deck officer can operate FA-150 or the conning position.
    For example, it is recommended to mount the AIS in the vicinity of places where Radar or ECDIS is mounted, or the center of chart table or conning position.

11. For vessels which transiting through Panama Canal and sailing Saint Lawrence River in seaway, in addition, vessels that come in ports of the United States, a Pilot plug is required.
    The Pilot plug should be installed on the bridge near the pilot's operating position.
    For the Pilot plug, "AIS Pilot Plug" shall be indicated with an appropriate label.
    In addition, an AC plug for PC power supply of the pilot must be installed near the Pilot plug, too. For the receptacle, "Receptacle for Pilot PC" must be indicated.

    <u>Pilot Plug</u>

    AMP/Receptacle (Square Flanged (-1) or Free-Hanging (2)), Shell size 11, 9-pin, Std. Sex 206486-1/2 or equivalent with the following terminations:
    - TX A is connected to Pin 1
    - TR A is connected to Pin 4
    - TX A is connected to Pin 5
    - RX B is connected to Pin 6
    - Shield is connected to Pin 9

Chapter 2. Parts Location

2.1 Transponder Unit : FA-1501

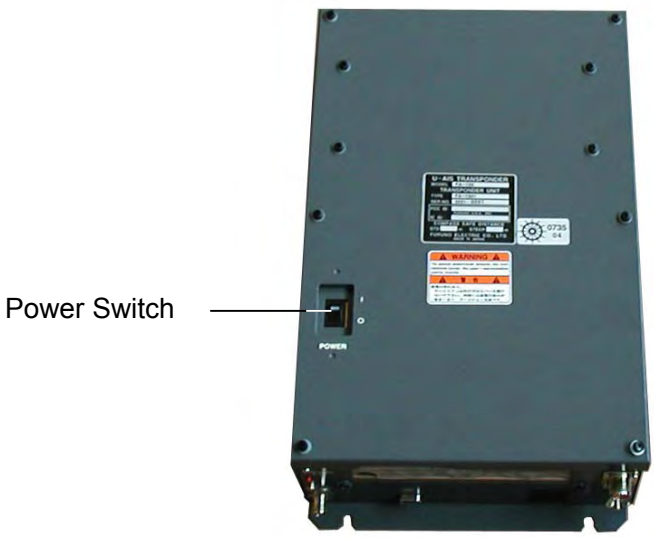


Fig. 2.1.1 FA-1501 Top view

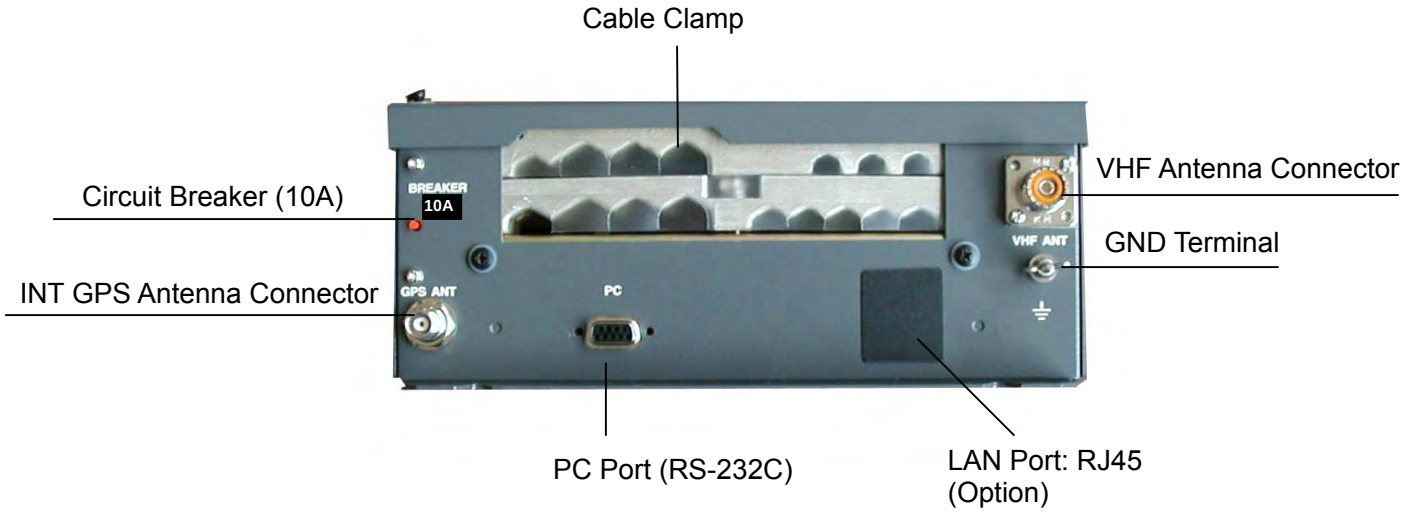


Fig. 2.1.2 FA-1501 Cable entrance

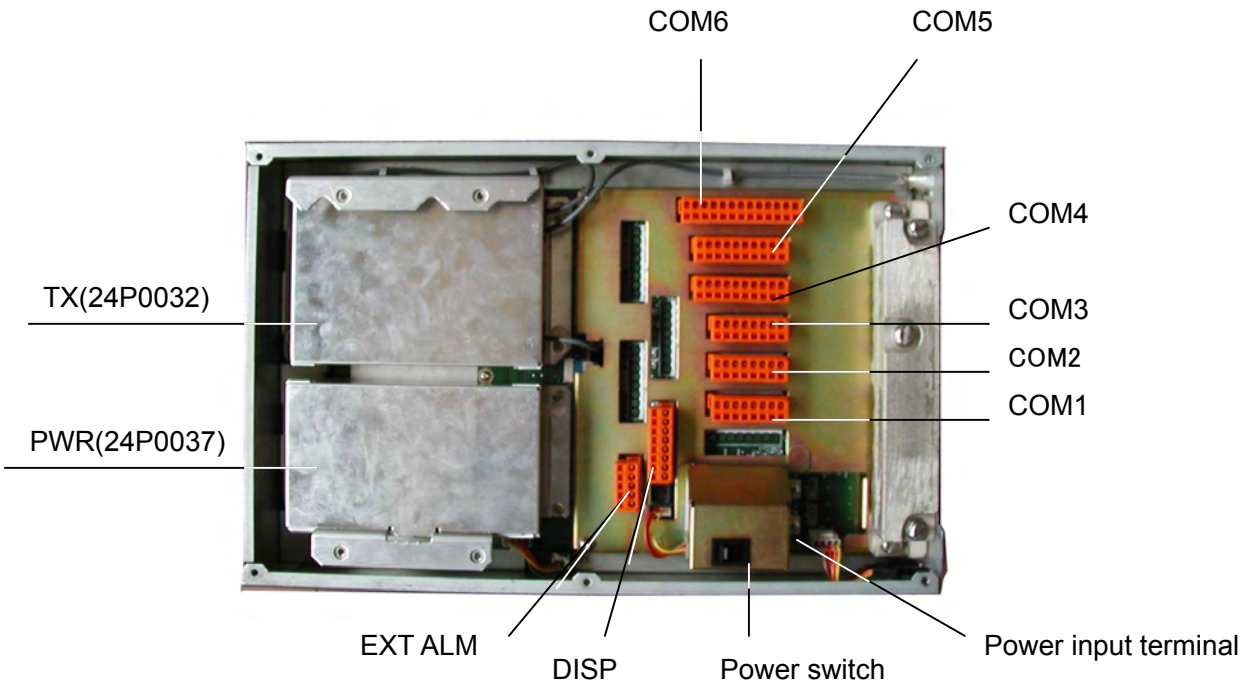


Fig. 2.1.3 FA-1501 Internal (Top) view (with cover opened)

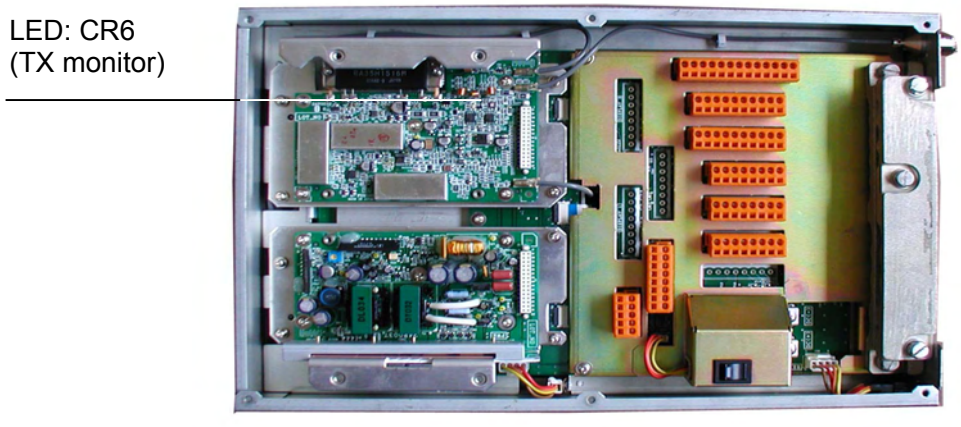


Fig. 2.1.4 FA-1501 Internal (Top) view (with Shield-cover removed)

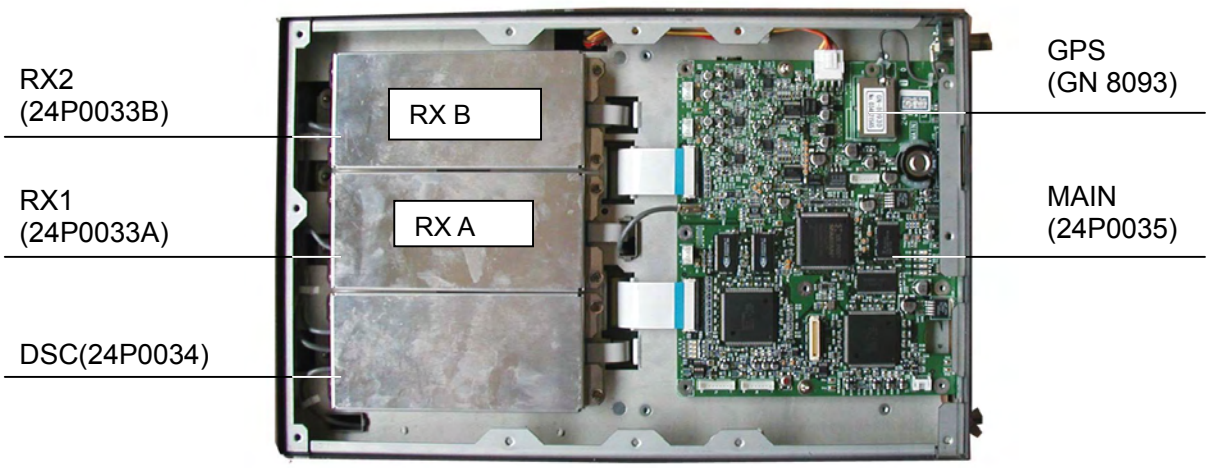


Fig. 2.1.5 FA-1501 Internal (Bottom) view

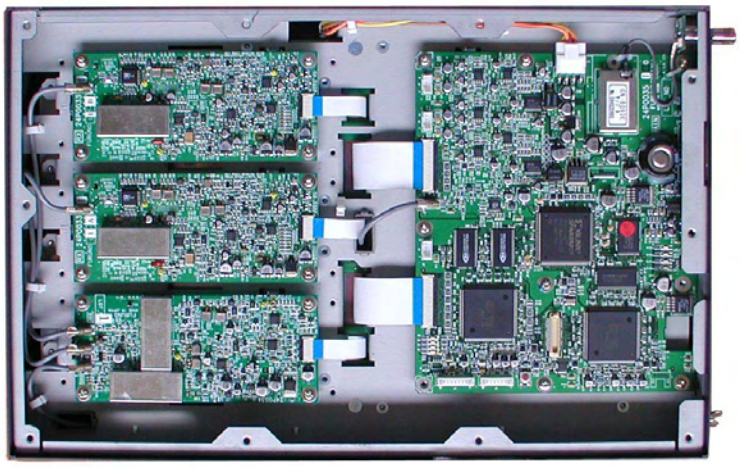


Fig. 2.1.6 FA-1501 Internal (Bottom) view (with Shield-covers removed)

2.2 FA-1501 PCBs

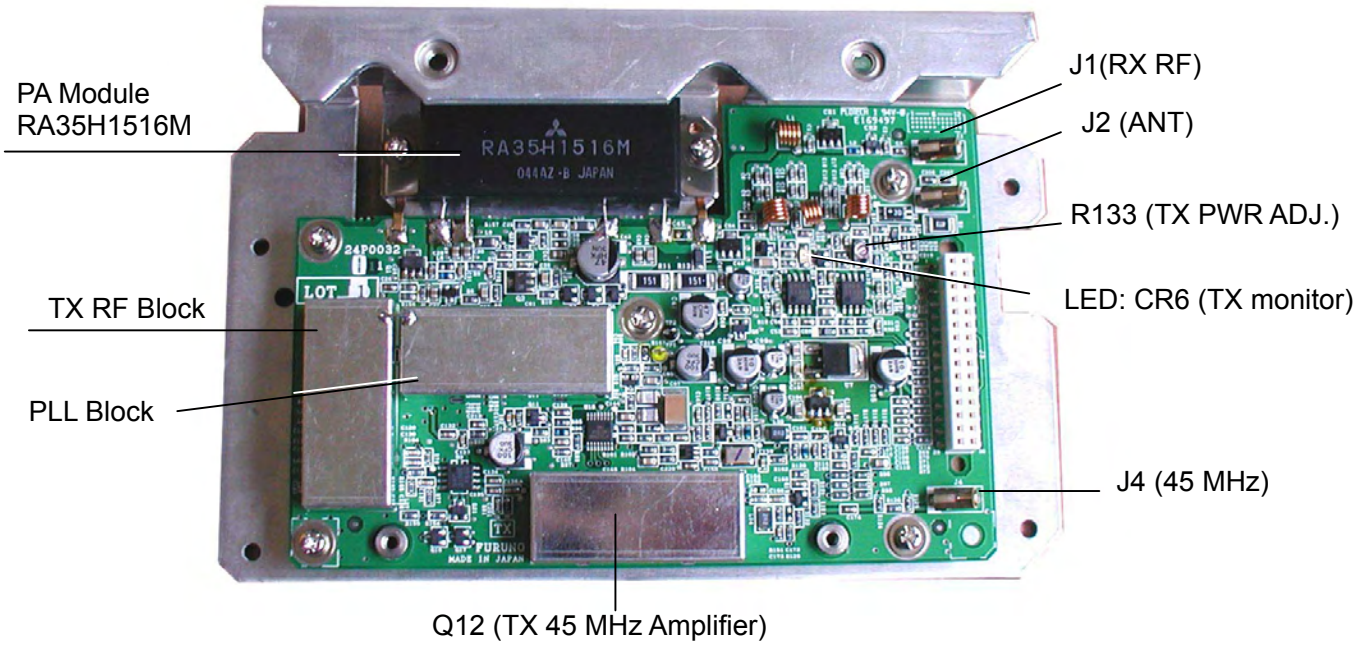


Fig. 2.2.1 TX Board (24P0032)

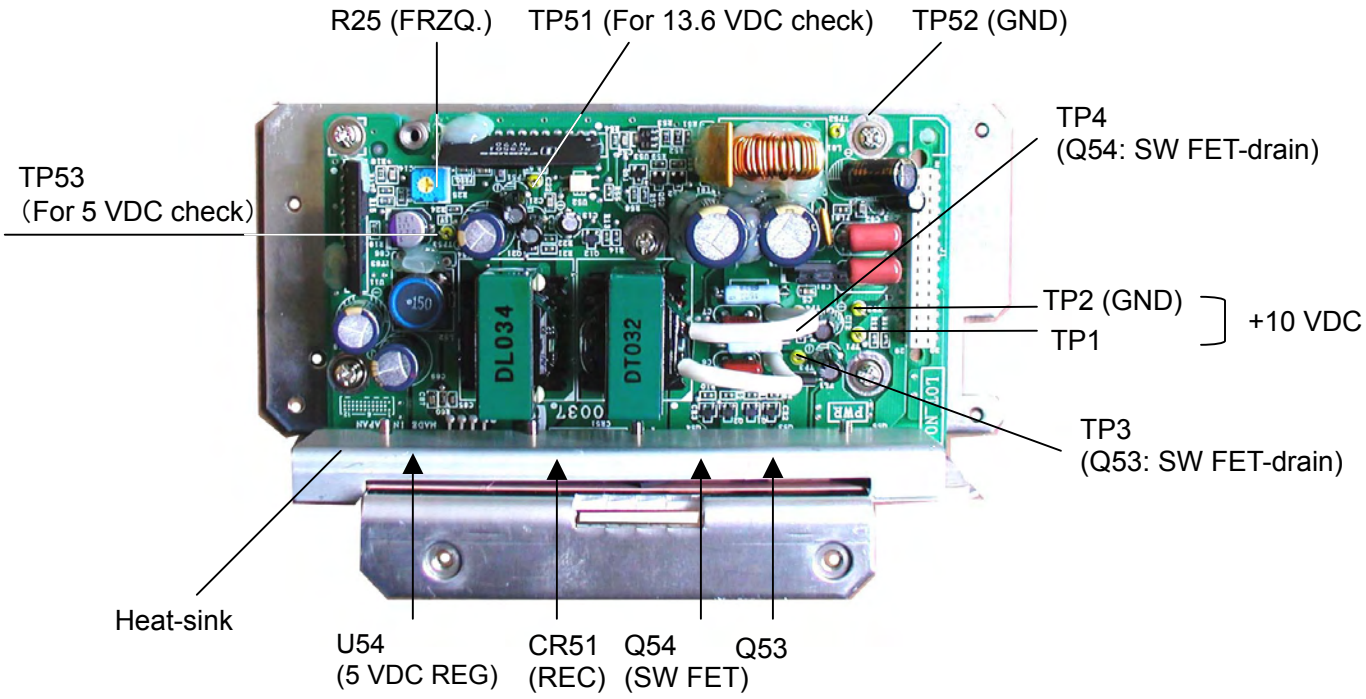


Fig. 2.2.2 PWR Board (24P0037)

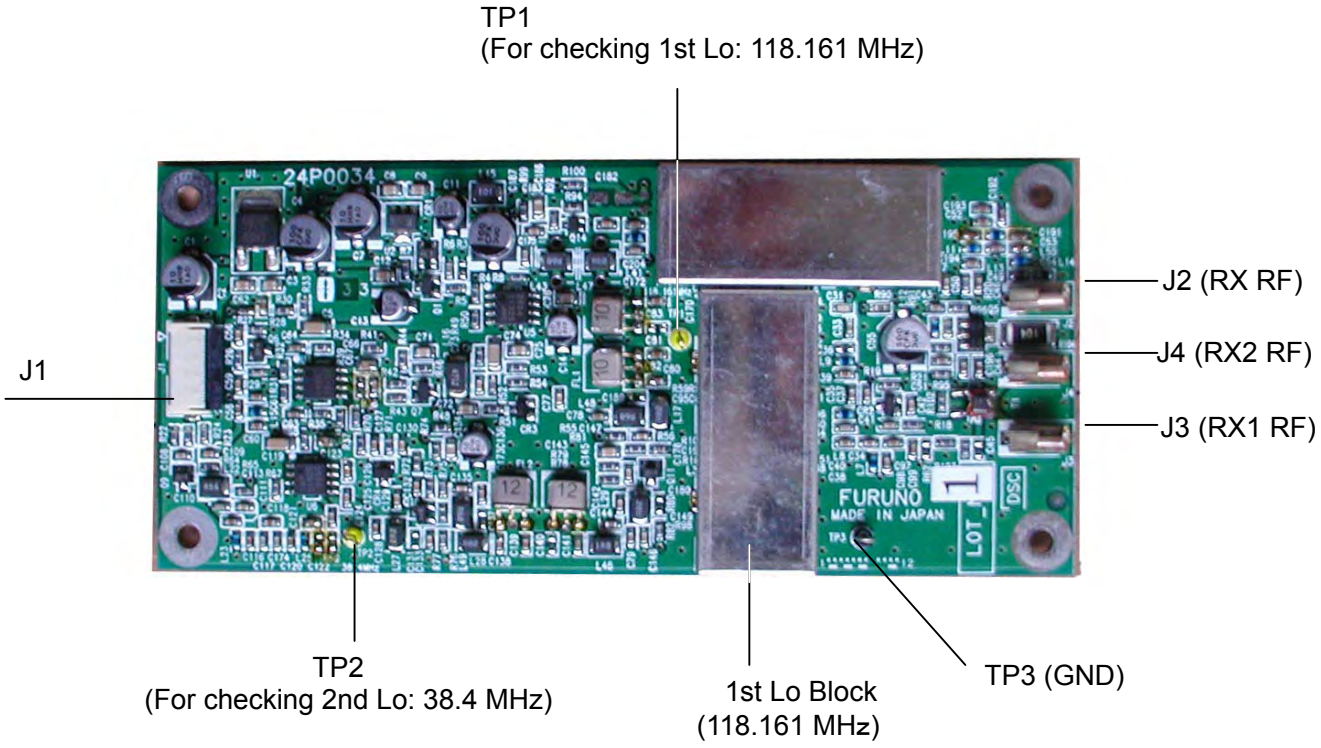


Fig. 2.2.3 DSC Board (24P0034)

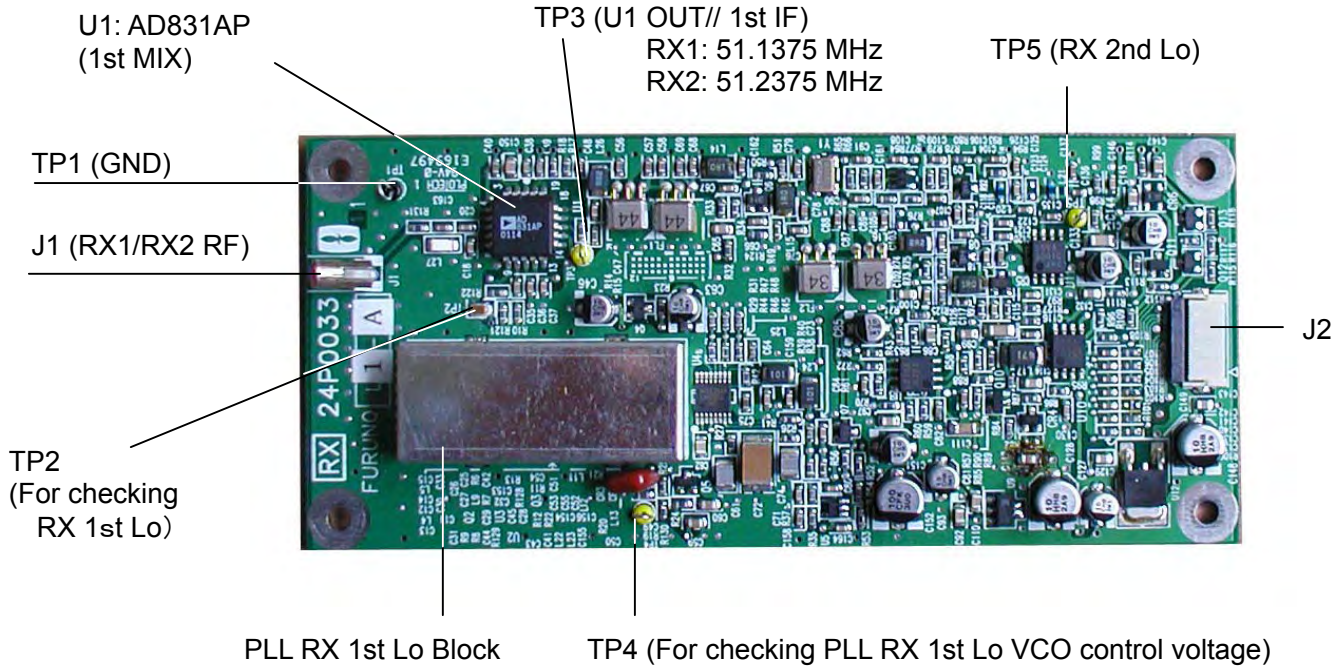


Fig. 2.2.4 RX1/RX2 Board

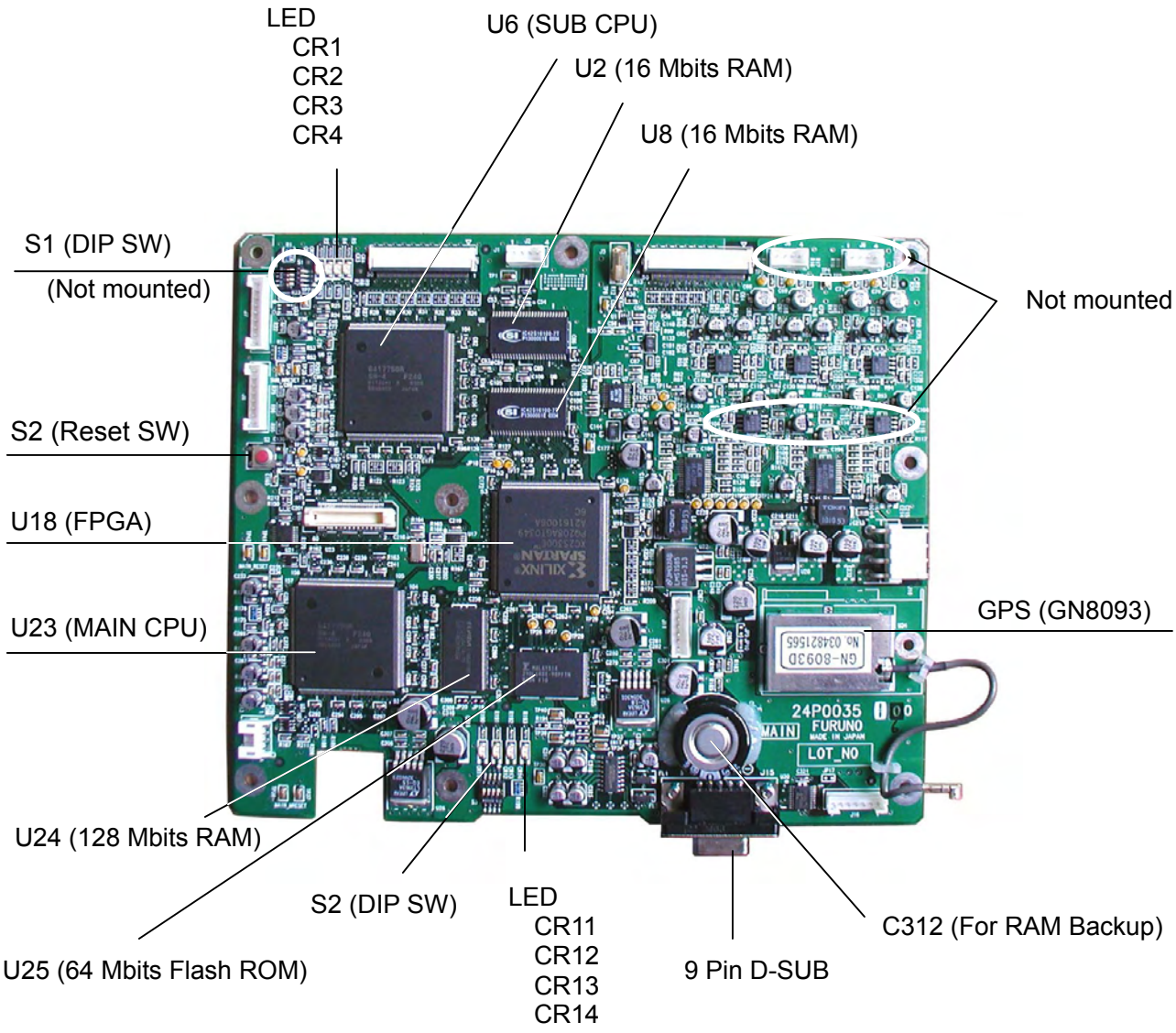


Fig. 2.2.5 MAIN Board (24P0035)

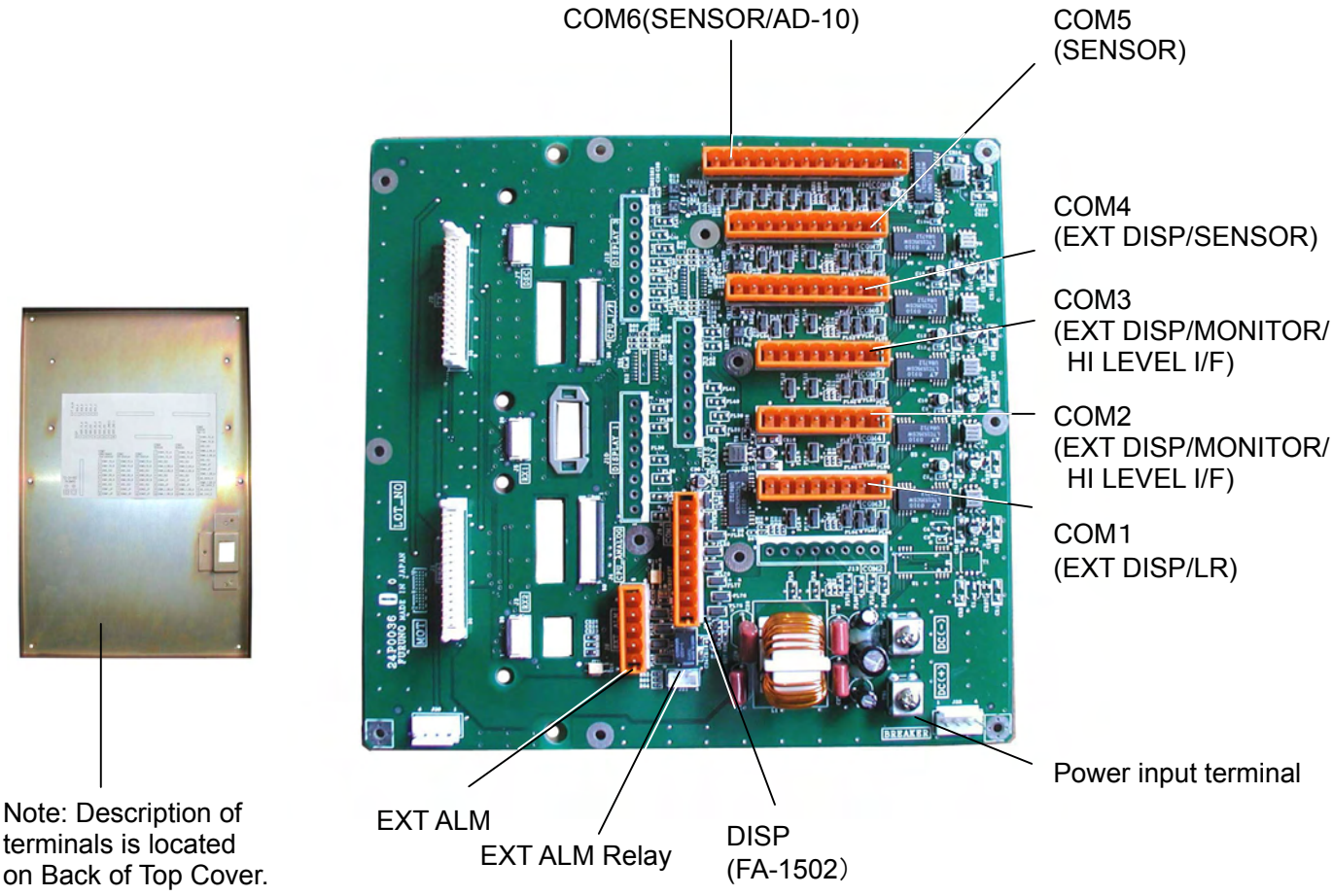


Fig. 2.2.6 MOT Board (24P0036)

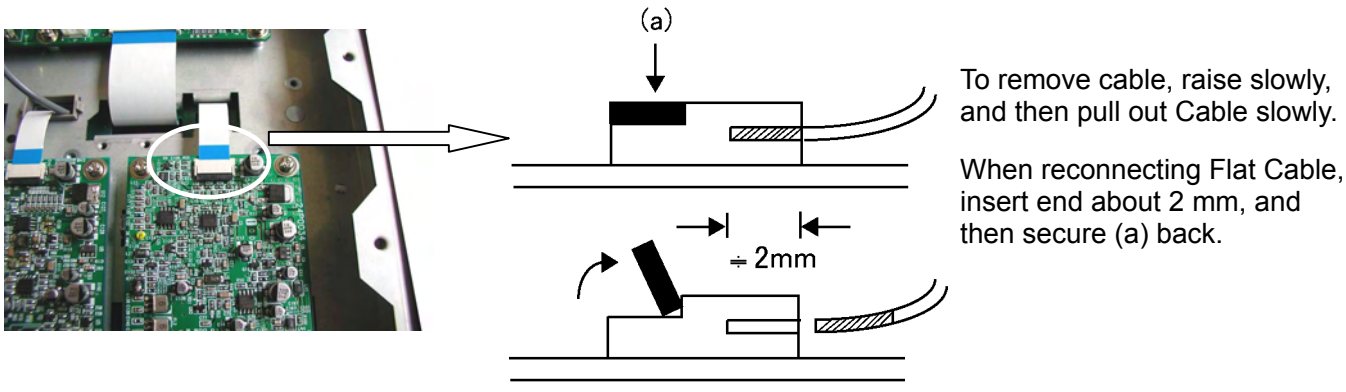
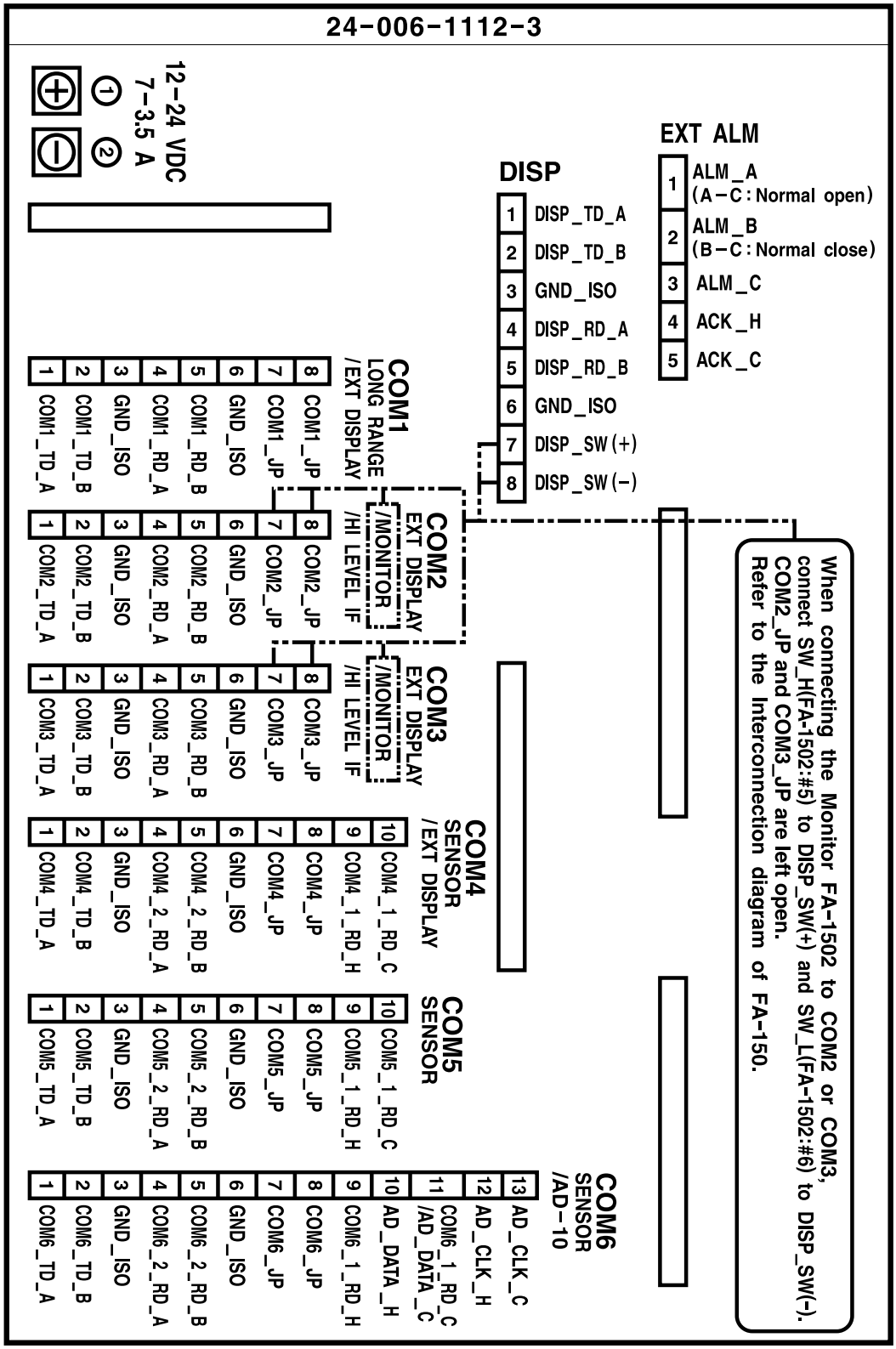

(a)
≒ 2mm
To remove cable, raise slowly,
and then pull out Cable slowly.
When reconnecting Flat Cable,
insert end about 2 mm, and
then secure (a) back.

Fig. 2.2.7 Removal/Insertion of Flat Cable

Terminal Description Label:



2.3 Monitor Unit: FA-1502

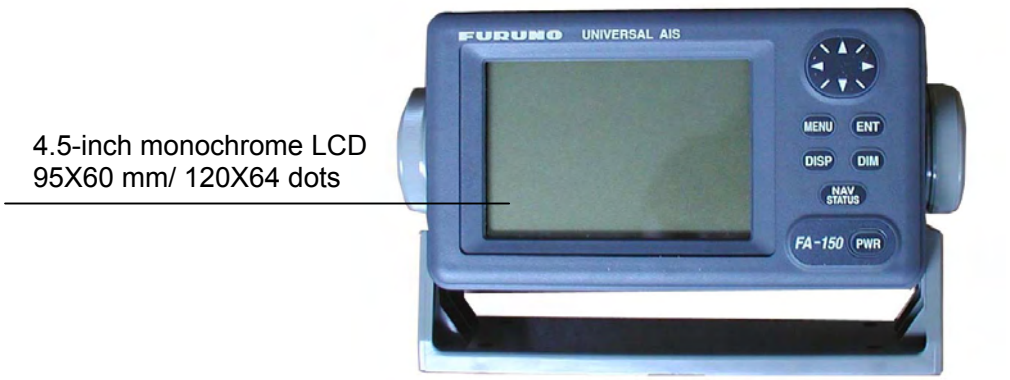


Fig. 2.3.1 FA-1502 Front view

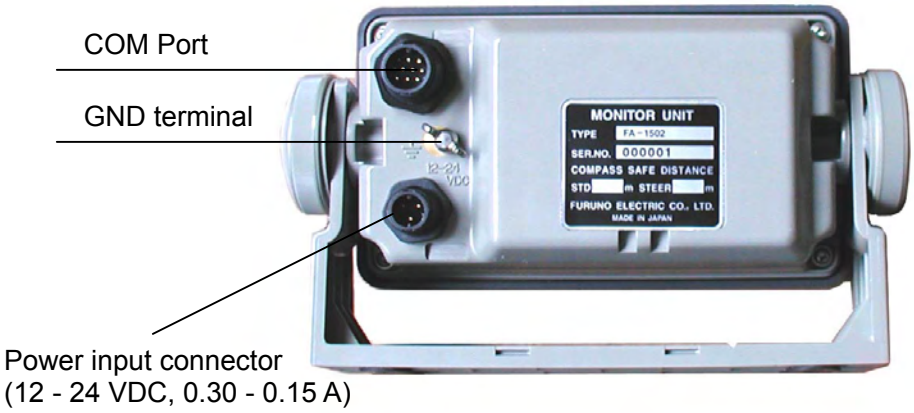


Fig. 2.3.2 FA-1502 Rear view

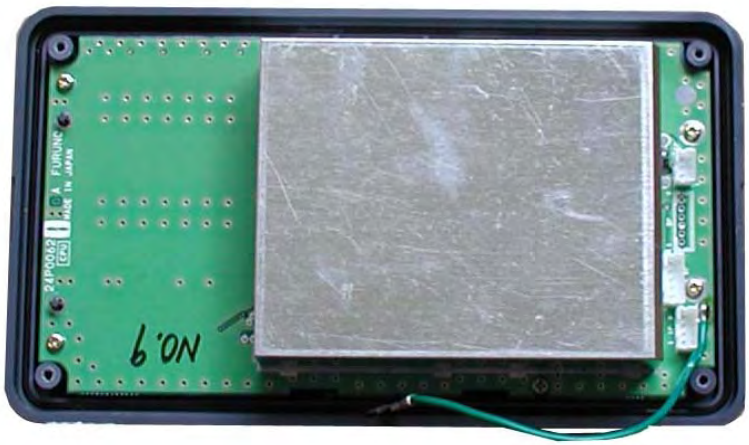


Fig. 2.3.3 FA-1502 Internal view (with Rear cover removed)

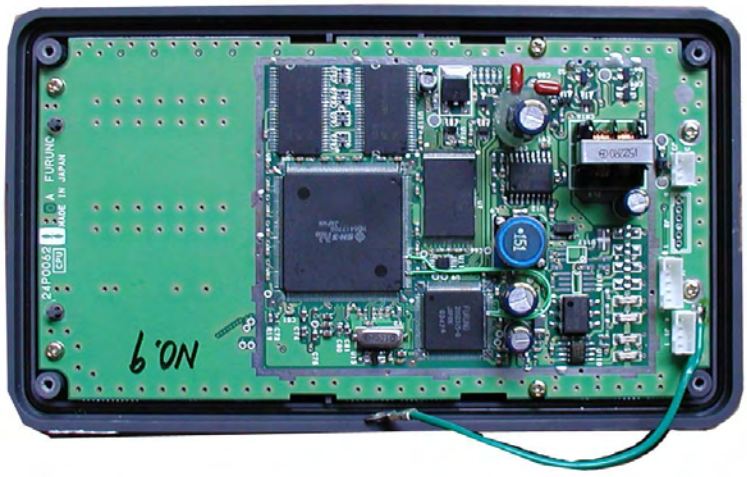


Fig. 2.3.4 FA-1502 Internal view (with Shield-cover removed)

2.4 Combined Antenna: GVA-100

Fig. 2.4.1 GVA-100

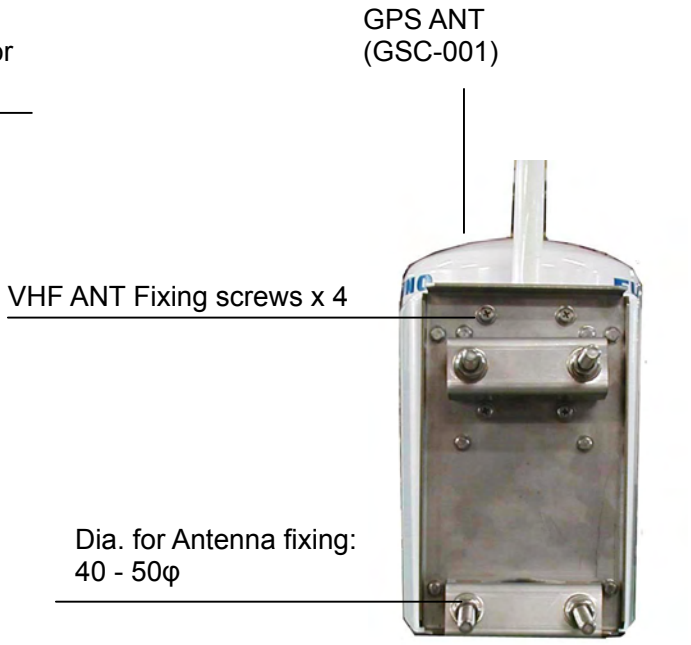


Fig. 2.4.2 GVA-100 Fixing side

Fig. 2.4.3 GVA-100 Bottom cover removed

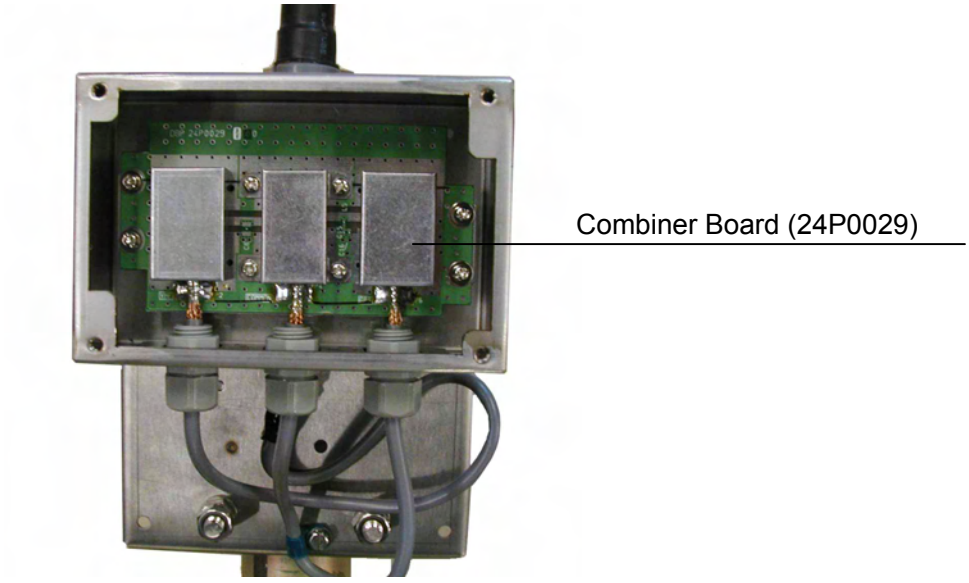


Fig. 2.4.4 Combined Box cover removed

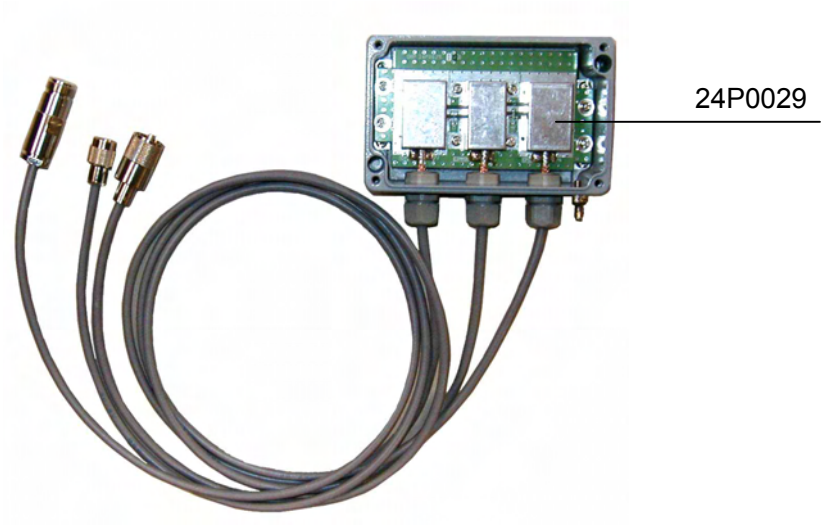
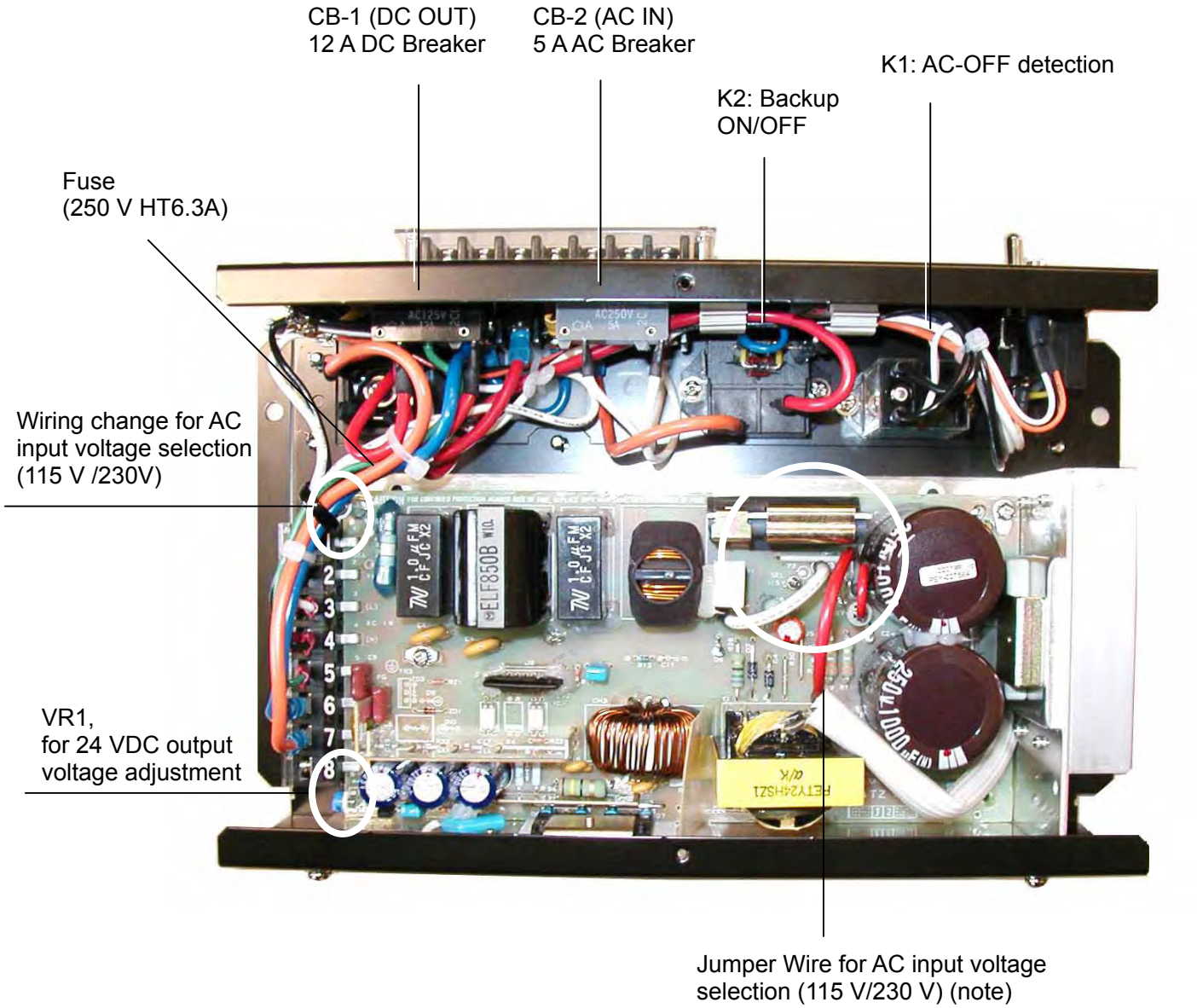


Fig. 2.4.5 Distributor (DB-1)

2.5 AC-DC Power supply: PR-240-CE



Note: For AC input voltage selection, see page 3-29 for details.

3.1 Overview of Initial Settings

Items to be set are as follows. To open the Initial Settings menu, the password must be entered. See FQ4-2005-012 for the password or refer to Fig. 3.1.1.

Table 3.1.1 Initial Settings Menu

MENU-1	MENU-2	MENU-3	MENU-4	Setting
INITIAL SETTINGS	SET MMSI			MMSI
				IMO #
				NAME
				C.SIN
	SET INT ANT POS.			A, B, C, D
	SET EXT ANT POS.			A, B, C, D
	SET SHIP TYPE			10 - 90 (Number of tens only) *Cargo type -> [NAV STATUS]*
	SET I/O PORT	SET COM PORT	COM 1	MODE and SPEED
			COM 2	MODE and SPEED
			COM 3	MODE and SPEED
			COM 4	MODE and SPEED
			COM 5	SENSOR SPEED
			COM 6	SENSOR SPEED
		SET PC PORT		MODE and SPEED
		SET LAN PORT		MODE, IP ADDRESS, SUBNET MASK, and PORT No.
		SET PRIORITY	L/L, COG, SOG	COM 4, 5, 6 -> 1, 2, 3
			HDG	COM 4, 5, 6 -> 1, 2, 3
			ROT	COM 4, 5, 6 -> 1, 2, 3

Data entry/selection method

Use [→] and [←] keys on the Cursor-Pad to shift the number of digit positions and [↑] and [↓] to choose characters and items, and press the [ENT] key to register data.

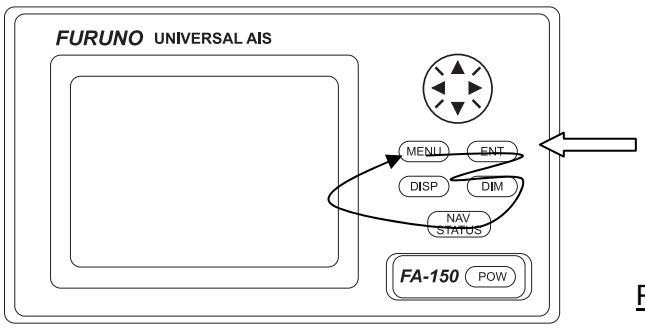


Fig. 3.1.1 FA-1501 panel

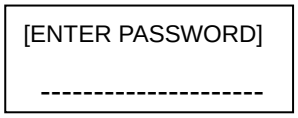
3.2 Initial Settings

3.2.1 MMSI, IMO No., Ship name and Call sign Settings

Unless MMSI is entered, the prompt “ENTER MMSI” is displayed on the plotter screen.
In addition, transmission of position report and others are not started.
However, messages can be received.
IMO No., Ship name, and Call sign are transmitted as MSG-5: static data every 6 minutes.

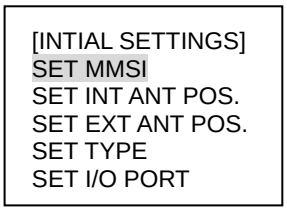
Procedure

1. Press the [MENU] key, choose INITIAL SETTINGS and press the [ENT] key. Then, the password entry screen appears.

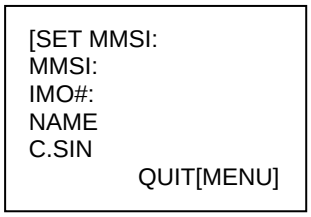


2. Enter the password. Refer to Fig. 3.1.1.

3. The INITIAL SETTINGS entry screen appears.



4. Choose SET MMSI and press the [ENT] key.



5. Register MMSI, IMO#, NAME, and C.SIN by the Cursor-Pad.
   - MMSI : Entry of 9-digit MMSI (Maritime Mobile Service Identity). 000000000 indicates that MMSI is not registered.
   - IMO# : Enter of 7-digit IMO number following 00. 000000000 indicates that IMO number is not registered.
   - NAME : Enter ship name, up to 20 characters can be entered.
   - C.SIN : Enter call sign, up to not 7 characters can be entered.

   Every time each item is entered, press the [ENT] key, and then, enter the next item.
   On completion of settings, press the [MENU] key to escape this screen.

Note: When using special characters instead of NAME (20) and C.SIN (7) characters, 3 characters are used. So, maximum characters are not entered.
Special characters: $ * , ! ^ ~ ＼

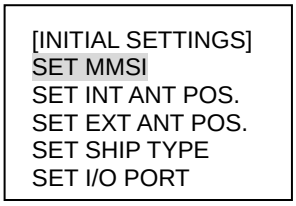
3.2.2 SET INT ANT POS and SET EXT ANT POS Settings

Enter the internal GPS antenna position: SET INT ANT POS and the external GPS antenna position: SET EXT ANT POS connected as a sensor input.
The data registered here is transmitted as static data; MSG-5 every 6 minutes, and the receiver can calculate the ship length and the width from this data. The antenna position data is the data of either external or internal GPS used for the present position report message.

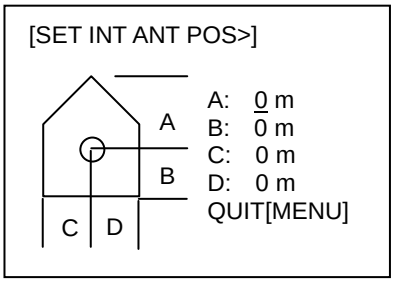
Procedure

1. Press the [MENU] key, choose INITIAL SETTINGS, press the [ENT] key, and enter the password. Refer to Fig. 3.1.1.

2. The INITIAL SETTINGS entry screen appears.



3. Choose SET ANT POS. and press the [ENT] key.



4. Using the Cursor-Pad, enter the position of internal GPS antenna. After entry of each setting, press the [ENT] key.
   - A: distance of GPS antenna from bow ; 0 - 511 m
   - B: distance of GPS antenna from stern ; 0 - 511 m
   - C: distance of GPS antenna from port ; 0 - 63 m
   - D: distance of GPS antenna from starboard ; 0 - 63 m

5. Press the [MENU] key to return to the INITIAL SETTINGS entry screen.

6. Choose SET EXT ANT POS. and press the [ENT] key.

7. Same as SET INT ANT POS., enter the position of the external GPS antenna.

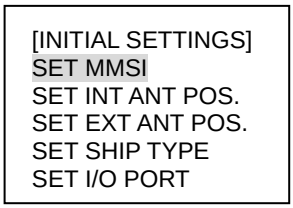
3.2.3 SET SHIP TYPE Setting

The type of ship such as cargo ships, tankers, HSC, etc. should be entered.
Note that the type of cargo (i.e. 7***1*** : Cargo ships carrying DG, HS, or MP-A) should be set in "CARGO TYPE & CREW" on the [NAV STATUS] menu. This data is transmitted in the static data: MSG-5 reported every 6 minutes, and the receiver is able to determine the ship's type (included cargo type). See Table 3.2.1 on the next page.

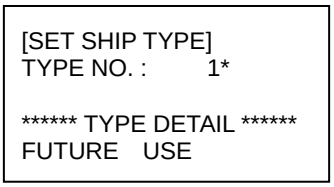
Procedure

1. Press the [MENU] key, choose INITIAL SETTINGS, press the [ENT] key and enter the password. Refer to Fig. 3.1.1.

2. The INITIAL SETTINGS entry screen appears.



3. Choose SET SHIP TYPE and press the [ENT] key.



No.	Type	No.	Type
1*	Future use	6*	Passenger ship
2*	WIG	7*	Cargo ship
3*	Vessel	8*	Tanker
4*	High Speed Craft	9*	Other type of ship
5*	Special Craft		

4. Using the Cursor-Pad, choose the type of ship and press the [ENT] key. In this part of the section, the tens digit only is set.

Related setting:

In [CARGO TYPE & CREW] of the [NAV STATUS] menu, set cargo for each ship's of the units digit.

** i.g. 7***1*** :Cargo ships carrying DG, HS, or MP-A **

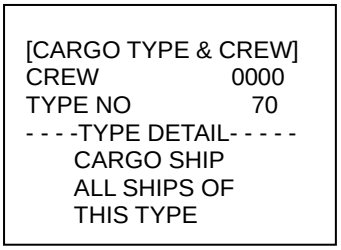


Table 3.2.1 Type of ship table

Identifiers to be used by ship to report their type			
Identifier No.	Special craft		
50	Pilot		
51	SAR vessel		
52	Tugs		
53	Port tender		
54	Vessels with anti-pollution facilities or equipment		
55	Law enforcement vessels		
56	Spare-for assignment to local vessels		
57	Spare-for assignment to local vessels		
58	Medical trans ports (as define in the 1949 Geneva Conventions and Additional Protocols)		
59	Ship according to Resolution 18(mob-83)		
First digit (*)	**Second digit (*)**	**First digit (*)**	**Second digit (*)**
1-reserved for future use	0-All ships of this type		0-Fishing
2-WIG	1-Carrying DG, HS, or MP IMO hazard or pollutant category A		1-Towing
3-see right column	2-Carrying DG, HS, or MP IMO hazard or pollutant category B	3-Vessel	2-Towing and length of the tow exceeds 200m or breadth exceeds 25m
4-HSC	3-Carrying DG, HS, or MP IMO hazard or pollutant category C		3-Engaged in dredging or underwater operations
5-see above	4-Carrying DG, HS, or MP IMO hazard or pollutant category D		4-Engaged in diving operations
	5-reserved for future use		5-Engaged in military operations
6-Passenger ships	6-reserved for future use		6-Sailing
7-Cargo ships	7-reserved for future use		7-Pleasure Craft
8-Tanker(s)	8-reserved for future use		8-reserved for future use
9-Other types of ship	9-No additional information		9-reserved for future use

Note:

1. – DG; Dangerous Goods - HS; Harmful Substances - MP; Marine Pollutants

2. (*); The identifier should be constructed by selecting the appropriate first and second digits.

   For example, a general cargo ship not carrying dangerous goods, harmful substances, or marine pollutants; would use identifier “7,” because the first digit indicates the ship’s type.

   Since the second digit indicates the attribute of the ship, a general cargo ship is “0” of “0: All ships of this type.” Consequently, the code of a general cargo ship is “70.”

3.3 I/O Port Settings

3.3.1 Arrangement of connection ports

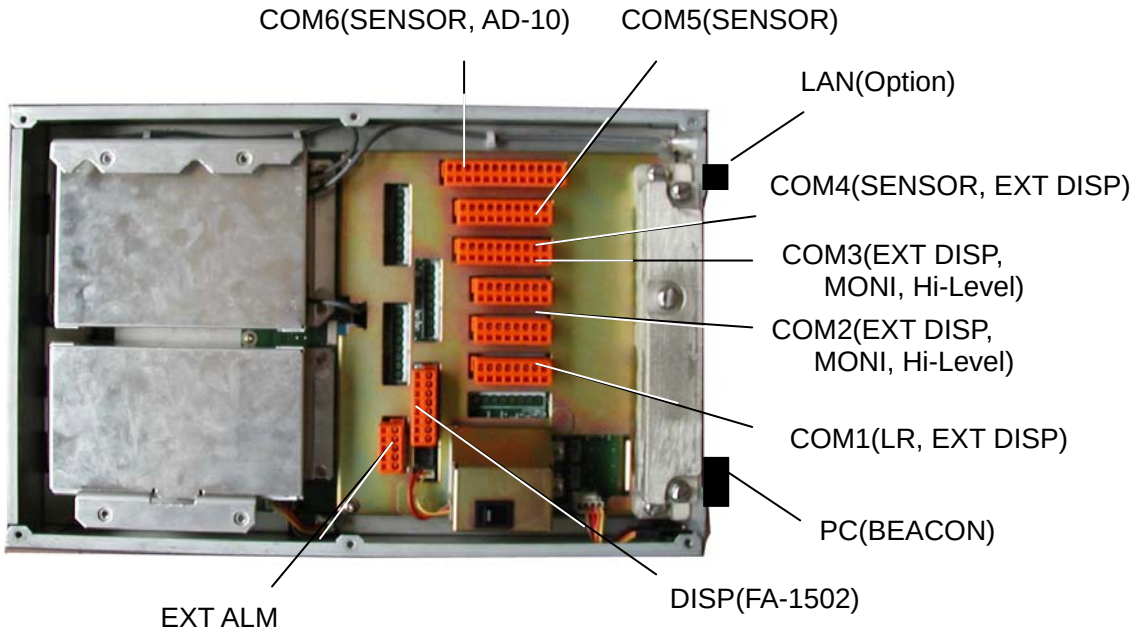


Fig. 3.3.1 Arrangement of connection ports

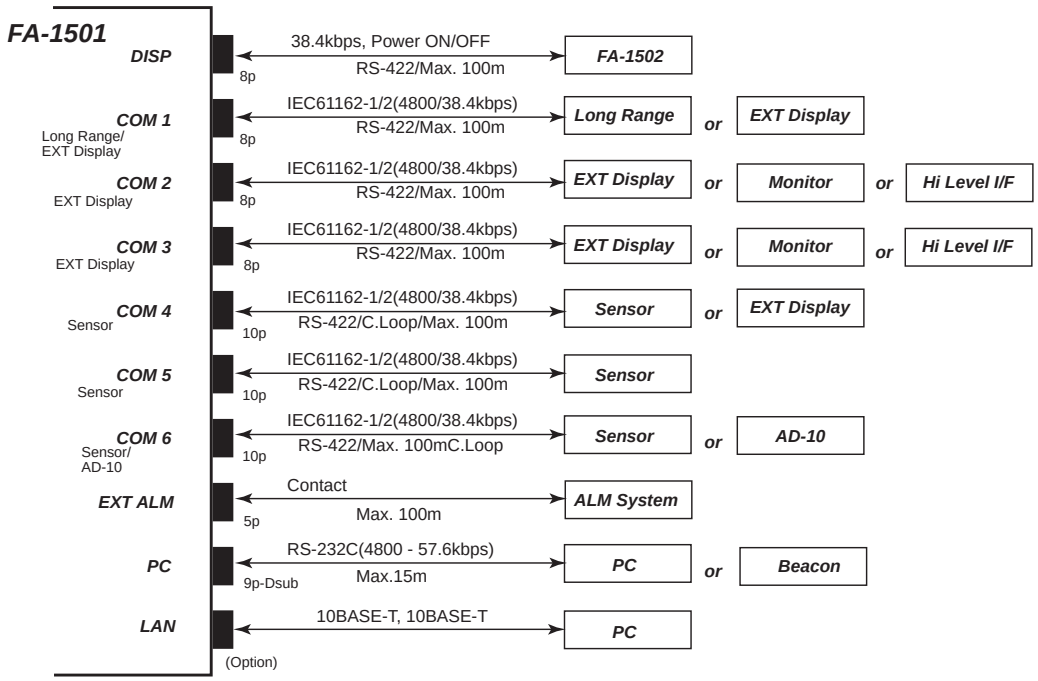


Fig. 3.3 2 FA-1501 connections

Table 3.3.1 Connected devices

Device	Description
LONG RANGE	Reserved for future service with INMARSAT C, HF equipment assumed. INMARSAT C equipment is assumed.
EXT DISPLAY	To be connected to Radar, ECDIS, and Pilot plug to provide AIS data display and carry out control.
MONITOR	As the second display, FA-1502 is connected.
HI LEVEL IF	To be connected to NAVNET 2 to provide AIS data display and carry out control.
SENSOR	Sensor inputted by IEC61162-1/2 or C.Loop. GPS: Pos., SOG and COG data / GYRO: HDG data / ROT: $TI ROT data
AD-10	AD-100. Gyro signals are inputted in Furuno AD format.
PC	Used for display or servicing.
BEACON	Beacon receiver: GR-80

3.3.2 I/O sentence table of COM, PC port

The I/O sentences of the table below are shown in the sentence column of COM Port Menu in the next page.

Table 3.3.2 Detail of I/O sentences

Sentence group		Sentences
Long Range output	1	LR1, LR2, LR3, LRF
AIS General output	2	VDM, VDO, ABK, ACA, ACS, ALR, TXT, LR1, LR2, LR3, LRF, LRI
AIS General input Long Range input	3	VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
Control command-1 (FA -> MONI)	4	Various kinds of PFEC, and VDM, VDO, ABK, ACA, ACS, ALR, TXT, LR1, LR2, LR3, LRF, LRI
Control command-2 (MONI -> FA)	5	Various kinds of PFEC, and VSD, SSD, ABM, BBM, ACK
Hi-Level output	6	Various kinds of PFEC for NAVNET 2, and VDM, VDO, ABK, ACA, ACS, ALR, TXT, LR1, LR2, LR3, LRF, LRI
Hi-Level input	7	Various kinds of PFEC for NAVNET 2, and VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
Service output	8	Control command-1 + various kinds of PFEC for R&D
Service input	9	Control command-2 + various kinds of PFEC for R&D

Note: Shaded settings indicate default values.

Table 3.3.3 COM port menu

Port	Setting		Spec.	I/O (Pin No.)	Sentence	
DISP			RS-422	Output (#1-2)	Control command-1	4
				Input (#4-5)	Control command-2	5
COM 1	MODE	LONG RANGE	RS-422	Output (#1-2)	Long Range output	1
				Input (#4-5)	AIS General input	3
		EXT DISPLAY		Output (#1-2)	AIS General output	2
				Input (#4-5)	AIS General input	3
		DISABLE			No I/O	
	SPEED	IEC 61162-1				
		IEC 61162-2				
COM 2	MODE	EXT DISPLAY	RS-422	Output (#1-2)	AIS General output	2
				Input (#4-5)	AIS General input	3
		MONITOR		Output (#1-2)	Control command-1	4
				Input (#4-5)	Control command-2	5
		HI LEVEL IF		Output (#1-2)	Hi-Level output	6
				Input (#4-5)	Hi-Level input	7
		DISABLE			No I/O	
	SPEED	IEC 61162-1				
		IEC 61162-2				
COM 3	MODE	EXT DISPLAY	RS-422	Output (#1-2)	AIS General output	2
				Input (#4-5)	AIS General input	3
		MONITOR		Output (#1-2)	Control command-1	4
				Input (#4-5)	Control command-2	5
		HI LEVEL IF		Output (#1-2)	Hi-Level output	6
				Input (#4-5)	Hi-Level input	7
		DISABLE			No I/O	
	SPEED	IEC 61162-1				
		IEC 61162-2				
COM4	MODE	SENSOR	RS-422	Output (#1-2)	No output	
				Input (#4-5)	AIS General input	3
			C.Loop	Input (#9-10)	AIS General input	3
		EXT DISPLAY	RS-422	Output (#1-2)	AIS General output	2
				Input (#4-5)	AIS General input	3
			C.Loop	Input (#9-10)	AIS General input	3
		DISABLE	RS-422		No I/O	
			C.Loop		No I/O	
	SPEED	IEC 61162-1				
		IEC 61162-2				
COM5	MODE	SENSOR	RS-422	Output (#1-2)	No output	
				Input (#4-5)	AIS General input	3
			C.Loop	Input (#9-10)	AIS General input	3
	SPEED	IEC 61162-1				
		IEC 61162-2				
COM6	MODE	SENSOR	RS-422	Output (#1-2)	No output	
				Input (#4-5)	AIS General input	3
			C.Loop	Input (#9-11)	AIS General input	3
	SPEED	IEC 61162-1				
		IEC 61162-2				
		AD-10	C.Loop	Input (#10-11)	AD DATA	
				Input (#12-13)	AD CLK	

Table 3.3.4 PC port menu

Port		Setting	Spec.	I/O (Pin No.)	Sentence	
PC	MODE	STANDARD	RS-232C	Output (#2)	AIS General output	2
				Input (#3)	AIS General input	3
		MONITOR		Output (#2)	Control command-1	4
				Input (#3)	Control command-2	5
		SERVICE		Output (#2)	Service output	8
				Input (#3)	Service input	9
		BEACON		Output (#2)	No output	
				Input (#3)	RTCM-SC-104	
		DISABLE			No I/O	
	SPEED	4800 BPS				
		9600 BPS				
		19.2 KBPS				
		38.4 KBPS				
		57.6 KBPS				

Note:

1. IEC 61162-1 data speed is 4,800 bps, and IEC 61162-2 is 38.4 kbps.

2. C. Loop and RS-422 for COM4 to COM6 can not be used at the same time. You must choose C.Loop or RS-422.

3. Set the data output interval of Furuno AD format data within 1 second on the AD-100 side.

4. MODE setting of the PC port means:
   - STANDARD ; Same as EXT DISPLAY, handles the same commands.
   - MONITOR ; Same as MONITOR of DISP, COM2, 3, handles the same commands.
   - SERVICE ; Same as MONITOR of DISP, COM2, 3, handles the same commands. In addition, it is able to partly transmit the debug code.
   - BEACON ; Connects GR-80.

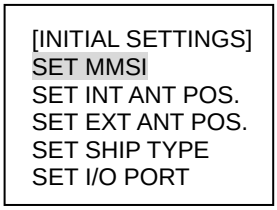
3.3.3 SET COM PORT Settings

This is to set the parameters of the ports that sensors, Radar, ECDIS, Pilot plug, etc. are connected to.

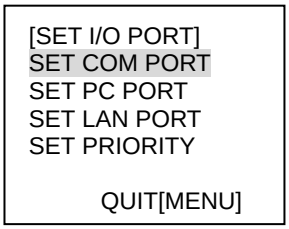
Procedure

1. Press the [MENU] key, choose INITIAL SETTINGS, press the [ENT] key, and enter the password. Refer to Fig. 3.1.1 of page 3-1.

2. The INITIAL SETTINGS entry screen appears.



3. Choose SET I/O PORT and press the [ENT] key.



4. Choose SET COM PORT and set each COM port.

1. COM1 Setting

The connected devices type (MODE) and the communication speed (SPEED) that connect to the COM1 port are set up.

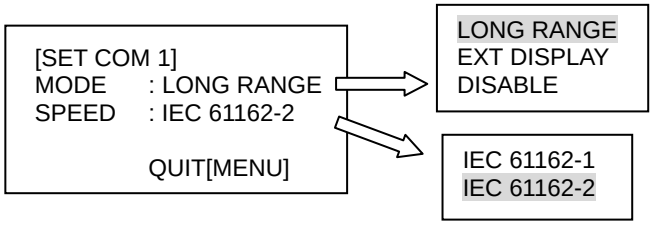


Table 3.3.5 COM1 setting

MODE	Devices	SPEED	Sentences	
LONG RANGE	INMARSAT-C	IEC 61162-2 (38.4 kbps)	TD	LR1, LR2, LR3, LRF
			RD	VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
EXT DISPLAY	RADAR, ECDIS, Pilot Plug	IEC 61162-2 (38.4 kbps)	TD	VDM, VDO, ABK, ACA, ACS, ALR, TXT, LR1, LR2, LR3, LRF, LRI
			RD	VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
DISABLE			TD	No output
			RD	No input

Note: COM1 port Setting

1. Basically, sensors should be connected to COM4, 5, and 6.
   However, since this port accepts Pos., SOG, COG, ROT and HDG sentences irrespective of MODE setting, sensors can be connected to here. However, the lowest priority is assigned for inputted data. See page 3-21, Setting of SET PRIORITY.

2. The specifications of this port are compatible with RS-422. Then TD-A/B and RD-A/B lines have the I/O circuits electrically separated by U2: LTC1535.
   In addition, the jumper between #7 and #8 of COM1 is a termination resistor of the TD data line. When more than one loads is connected to the TD-A/B line on the transmission side, a termination resistor should be mounted on the receiver side which has the electrically longest wiring. In the case of connecting FA-150 only, use a jumper to connect #7 and #8.

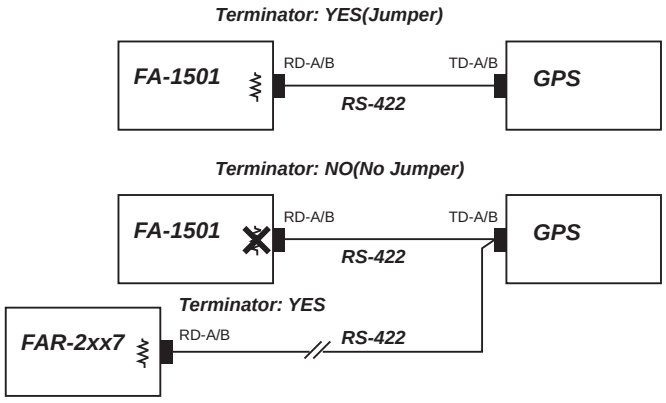


Fig. 3.3.3 Termination resistor

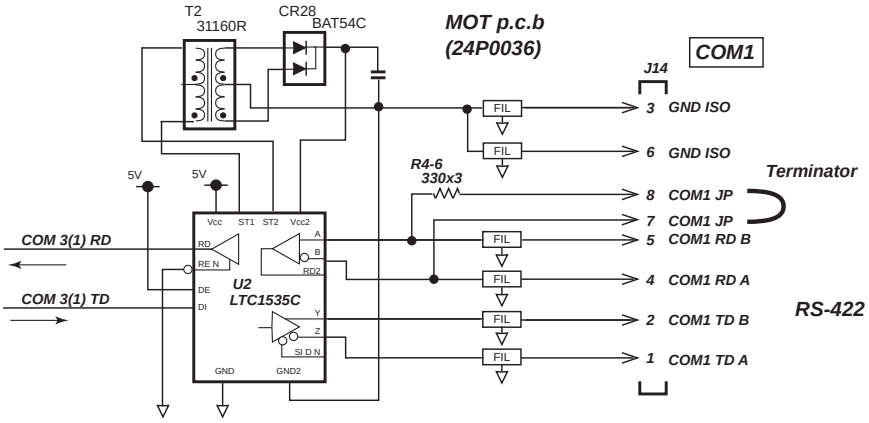


Fig. 3.3.4 COM 1 port I/O

2. COM2 and COM3 port Settings

Both COM2 and COM3 ports have the same electrical specifications and settings.

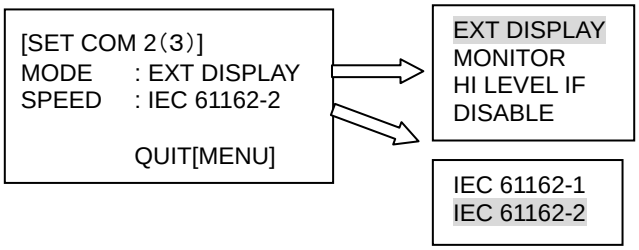


Table 3.3.6 COM2 and COM3 Settings

MODE	Devices	SPEED	Sentences	
EXT DISPLAY	RADAR, ECDIS, Pilot Plug	IEC 61162-2 (38.4 kbps)	TD	VDM, VDO, ABK, ACA, ACS, ALR, TXT, LR1, LR2, LR3, LRF, LRI
			RD	VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
MONITOR	FA-1502		TD	Various kinds of PFEC, and VDM, VDO, ABK, ACA, ACS, ALR, TXT, LR1, LR2, LR3, LRF, LRI
			RD	Various kinds of PFEC, and VSD, SSD, ABM, BBM, ACK
HI LEVEL IF	NAVNET2		TD	Various kinds of PFEC for NAVNET 2, and VDM, VDO, ABK, ACA, ACS, ALR, TXT, LR1, LR2, LR3, LRF, LRI
			RD	Various kinds of PFEC for NAVNET 2, and VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
DISABLE			TD	No output
			RD	No input

Note: COM2 and COM3 port Settings

They are same as those described in "***Note: COM1 port setting***" of Paragraphs 1 and 2.

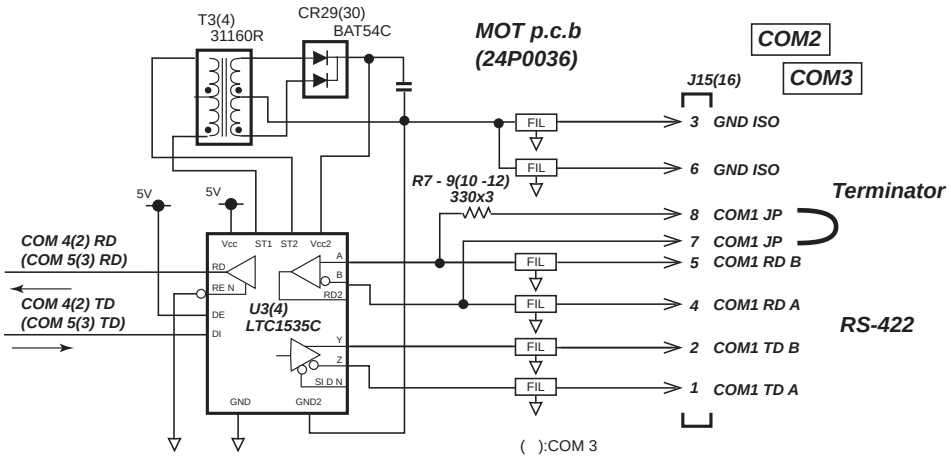
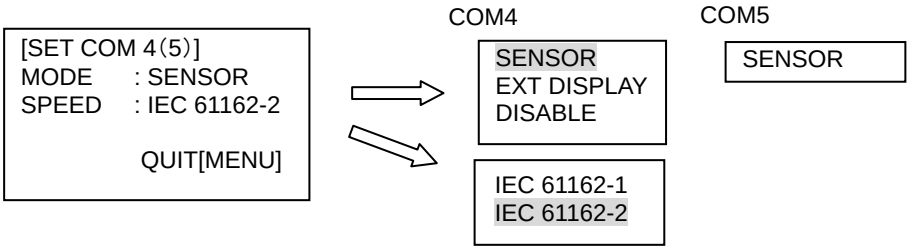


Fig. 3.3.5 COM 2 (3) port I/O

3. COM4 and COM5 port Settings

These ports support RS-422 and C. Loop specifications.



Note: COM4 and COM5 port settings

1. COM4 can be connected to EXT DISPLAY: Radar, ECDIS and Pilot plug. COM5 is a port dedicated to sensors.
   The RD data line of COM4 and COM5 ports supports for both RS-422 and C. LOOP specifications. Choose either one of them for data input. If data is inputted from both ports, both inputted data collide.

2. The specifications of this port are same as those described in "***Note: COM1 port setting***" Paragraphs 2.

Table 3.3.7 COM4 and COM5 Settings

Port	MODE	Data	Spec.	Devices	SPEED	Sentences
COM 4	SENSOR	TD: #1-#2				No output
		RD: #4-#5	RS-422	GPS, ROT, GYRO	IEC 61162-1	VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
		RD: #9-#10	C.Loop			
	EXT DISPLAY	TD: #1-#2	RS-422	RADAR, ECDIS, Pilot-Plug	IEC 61162-2	VDM, VDO, ABK, ACA, ACS, ALR, TXT, LR1, LR2, LR3, LRF, LRI
		RD: #4-#5	RS-422			VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
		RD: #9-#10	C.Loop			
	DISABLE	TD				No output
		RD				No input
COM 5	SENSOR	TD: #1-#2	RS-422			No output
		RD: #4-#5	RS-422	GPS, ROT, GYRO	IEC 61162-1	VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
		RD: #9-#10	C.Loop			

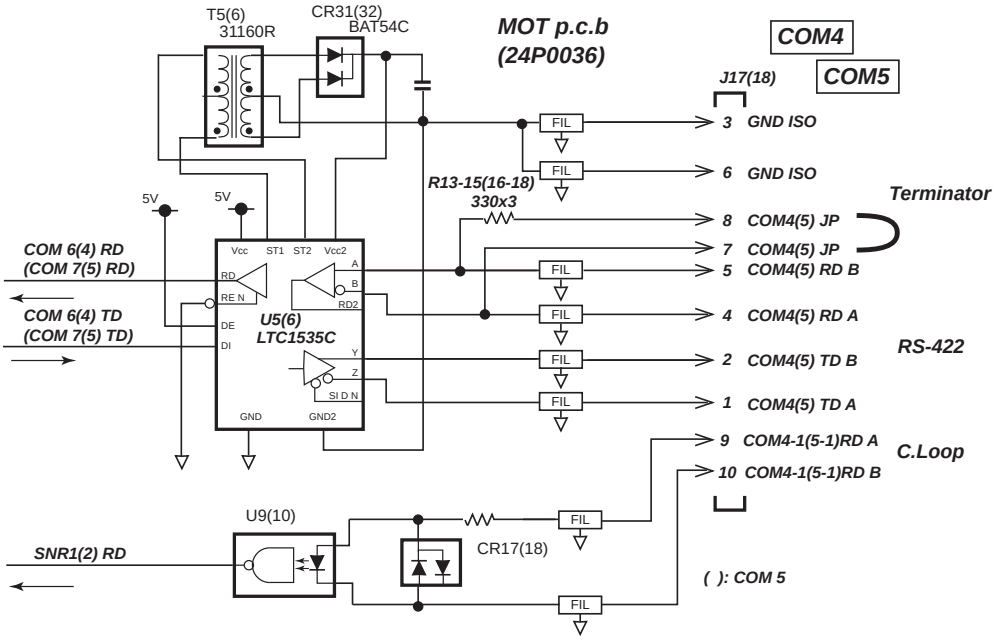
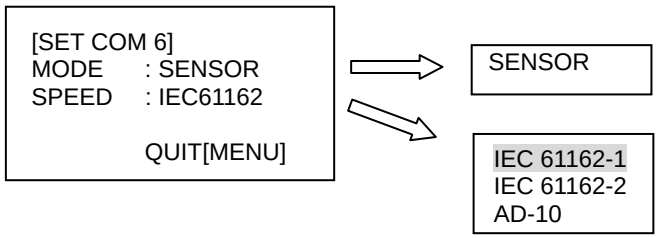


Fig. 3.3.6 COM4 (5) port I/O

4. COM6 Setting

This is a port dedicated for sensors. An AD converter data: Furuno AD format data should be connected to this port.



Note: setting of COM6

1. The RD data line of COM6 port supports for both RS-422 and C. LOOP specifications. Choose either one of them for data input. If data is inputted from both ports, both inputted data collide.
   C. Loop port shares one of sensor and AD converter data lines.
   Note:
   Input to AD data for C. Loop and RD of RS-422 cannot be used at the same time.

2. The specifications of this port are same as those described in "***Note: setting of COM1***" Paragraphs 2.

Table 3.3.8 COM6 setting

Port	MODE	Data	Spec.	Devices	SPEED	Sentences
COM 6	SENSOR	TD: #1-#2	RS-422			No output
		RD: #4-#5	RS-422	GPS, ROT, GYRO	IEC 61162-1	VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
		RD: #9-#11	C.Loop			
		AD DATA RD: #10-#11	C.Loop	AD-100	AD-10	FURUNO AD Format
		AD CLK RD: #12-#13				

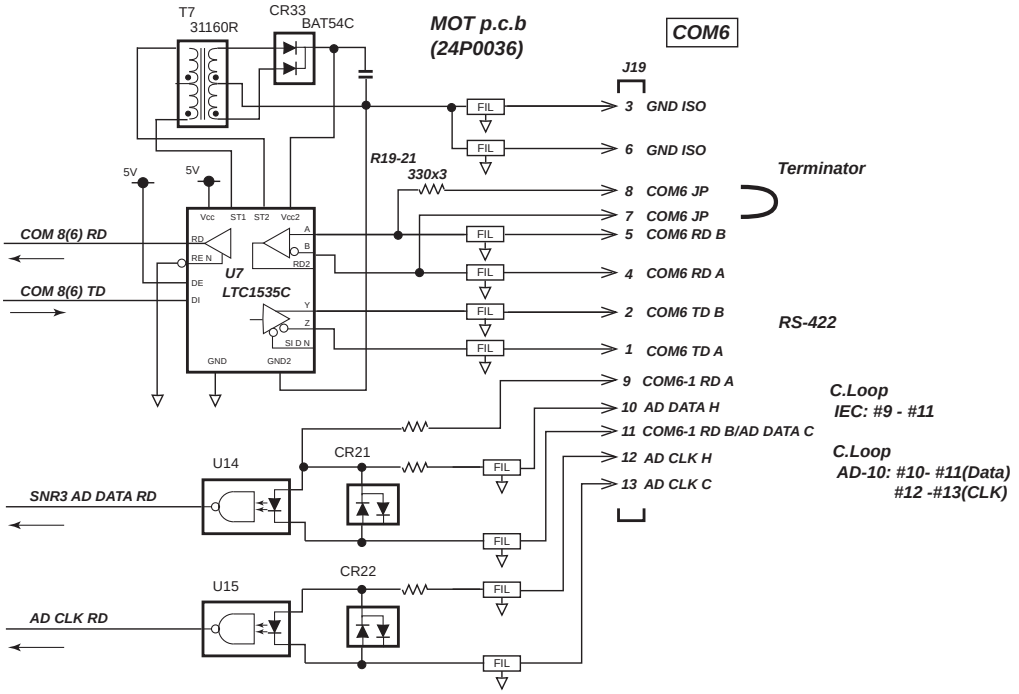


Fig. 3.3.7 COM6 port I/O

3.3.4 SET PC PORT Setting

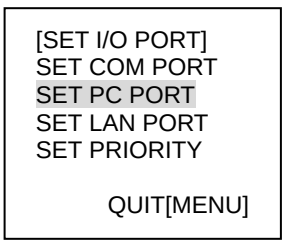
This port supports RS-232C specifications.

Procedure

1. Press the [MENU] key, choose INITIAL SETTINGS, press the [ENT] key and enter the password. Refer to Fig. 3.1.1 of page 3-1.

2. The INITIAL SETTINGS entry screen appears.

3. Choose SET I/O PORT and press the [ENT] key.



4. Choose SET PC PORT and set MODE and SPEED.

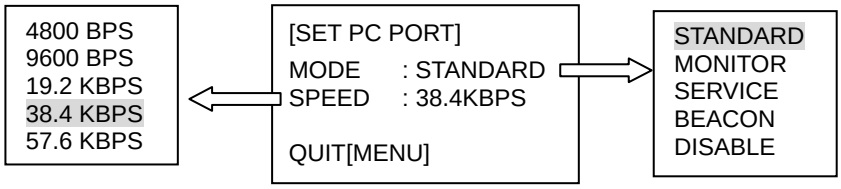


Table 3.3.9 PC PORT setting

MODE	Devices	SPEED	Sentences	
STANDARD	PC	IEC 61162-2 (38.4 kbps)	TD	VDM, VDO, ABK, ACA, ALR, TXT, LR1, LR2, LR3, LRF, LRI
			RD	VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
MONITOR	PC	IEC 61162-2 (38.4 kbps)	TD	Various kinds of PFEC, and VDM, VDO, ABK, ACA, ACS, ALR, TXT, LR1, LR2, LR3, LRF, LRI
			RD	Various kinds of PFEC, and VSD, SSD, ABM, BBM, ACK
SERVICE	PC		TD	Above-mentioned MONITOR TD Sentence + Various kinds of PFEC for R&D
			RD	Above-mentioned MONITOR RD Sentence + Various kinds of PFEC for R&D
BEACON	GR-80	4800	TD	No output
			RD	RTCM-SC-104
DISABLE			TD	No output
			RD	No input

Note:

MODE setting means the following:

- STANDARD ; Sentence same as EXT DISPLAY
- MONITOR ; To be set when PC-version AIS display is connected.
  PC-version AIS display software is FAISPC MARK2 (optional).
- SERVICE ; To be used for R&D.
- BEACON ; GR-80 is connected.

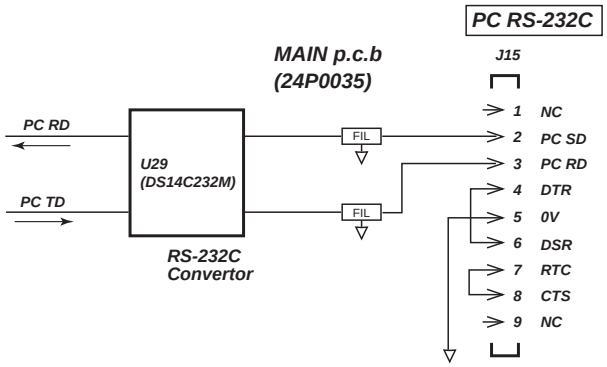


Fig. 3.3.8 PC port I/O

3.3.5 SET LAN PORT Setting

When LAN port is used, mount the NET-100 board (03P9332) to the MAIN board as shown in the photo. The NET-100 board is optional.
The specifications of this port are automatically changed over to 100BASE-T or 10BASE-T in accordance with the PC specifications.
The protocol is UDP (User Data-gram Protocol).

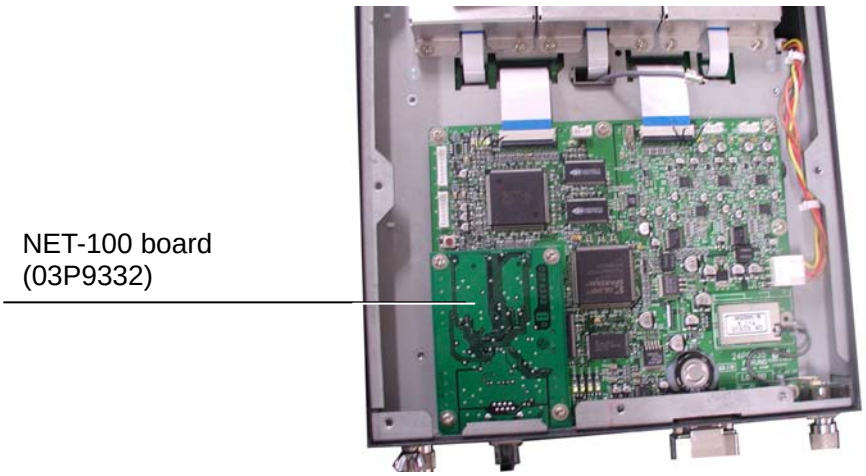


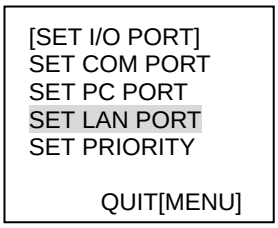
Fig. 3.3.9 Equipment of LAN board

Procedure

1. Press the [MENU] key, choose INITIAL SETTINGS, press the [ENT] key and enter the password. Refer to Fig. 3.1.1 of page 3-1.

2. The INITIAL SETTINGS entry screen appears.

3. Choose SET I/O PORT and press the [ENT] key.



4. Choose SET LAN PORT set MODE, IP ADDRESS, SUBNET MASK and PORT NO.

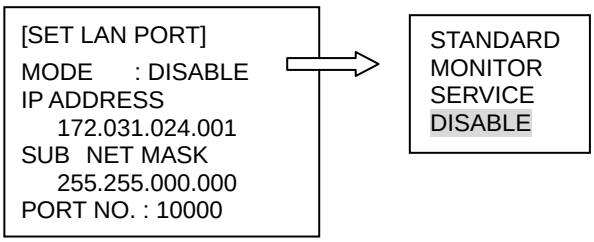


Table 3.3.10 LAN PORT setting

MODE	Devices	SPEED	Sentences	
STANDARD	PC	100 BASE-T 10 BASE-T (Automatically changed over in accordance with PC)	TD	VDM, VDO, ABK, ACA, ALR, TXT, LR1, LR2, LR3, LRF, LRI
			RD	VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
MONITOR	PC		TD	Various kinds of PFEC, and VDM, VDO, ABK, ACA, ACS, ALR, TXT, LR1, LR2, LR3, LRF, LRI
			RD	Various kinds of PFEC, and VSD, SSD, ABM, BBM, ACK
SERVICE	PC		TD	Above-mentioned MONITOR TD Sentence + PFEC for R&D
			RD	Above-mentioned MONITOR RD Sentence + PFEC for R&D
DISABLE			TD	No output
			RD	No input

Note:

MODE setting means the following:

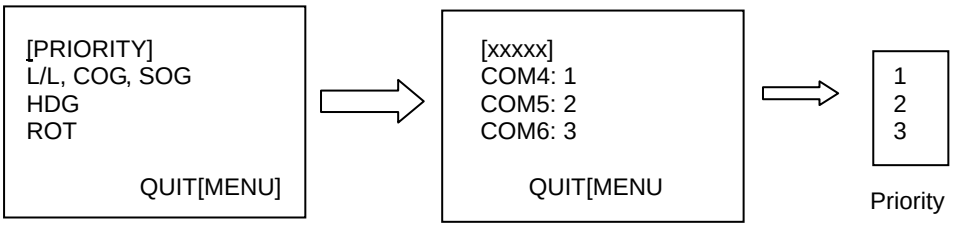
- STANDARD ; Sentence same as EXT DISPLAY. COM1 port is substituted for LAN.
- MONITOR ; To be set when PC-version AIS display is connected. PC-version AIS display software is FAISPC MARK2 (optional).
- SERVICE ; To be used for R&D.

3.3.6 SET PRIORITY Setting

This is the setting which data of the port should be preferentially used when the same sentence is inputted into COM4, COM5 and COM6. The highest priority is given to 1 which is followed by 2 and 3, in that order. The timeout of priority is 5 seconds. In 5 seconds after the data is unable to be received, the port is changed over to the port with the next priority.

Note:

COM1 through COM3 are given the lowest priority and are same level. Also, they do not have timeout function. When any data is inputted, its data accept. For example, the sensor data of the same sentence is entered in COM1 and COM2. "Data is spontaneously changed over" will occurs.

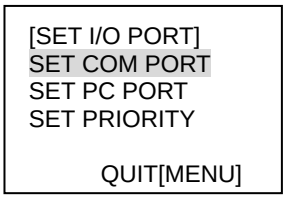


Procedure

1. Press the [MENU] key, choose INITIAL SETTINGS, press the [ENT] key and enter the password. Refer to Fig. 3.1.1 of page 3-1.

2. The INITIAL SETTINGS entry screen appears.

3. Choose SET I/O PORT and press the [ENT] key.



4. Choose SET PRIORITY and set priority of COM4, 5, and COM6.

Item		Settings
PRIORITY	L/L, COG, SOG	COM 4: 1, 2, 3
		COM 5: 1, 2, 3
		COM 6: 1, 2, 3
	HDG // ROT	COM 4: 1, 2, 3
		COM 5: 1, 2, 3
		COM 6: 1, 2, 3

3.4 EXT ALM Output Setting

ALARM MODE -> KEY STOP

In the default setting of ALARM MODE, the alarm message is outputted in pop-up display and EXT ALM signal when alarm is detected. Relay contact is also activated. Those alarms can be stopped / acknowledged by pressing any key of FA-1502. This will turn ON the External ALM ACK signal. EXT ALM output continues until the alarm event is removed.

ALARM MODE -> CONTINUOUS

To change the above alarm output form to the one in which the EXT ALM output is continued until the alarm event is removed as illustrated below, the following setting should be carried out.

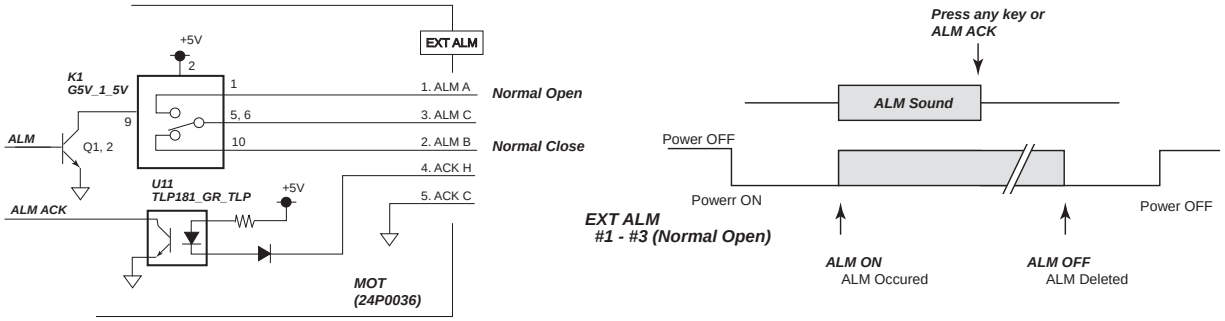


Fig. 3.4.1 Alarm output

Procedure

1. Choose ALARM MODE from [MENU] -> DIAGNOSTICS -> FOR SERVICE -> OTHER menu.

2. Set ALARM MODE.

- CONTINUOUS : EXT ALM output continues until the alarm event is removed. However, the alarm sound only can be stopped when ALM ACK signal is turned ON or pressing any key of FA-1502.

- KEY STOP (Default setting) : Alarm sound and EXT ALM output are turned OFF when ALM ACK signal is turned ON, pressing any key of FA-1502 or alarm event is removed.

3.5 CH MODE Setting

This is a setting that controls whether the FA-150 utilizes USA channel mode or on the INT (international) channel mode during Regional operation. This channel designation (control) in the Region operation setting is effective only by setting from DSC message or AIS message (MSG.22) from shore-based AIS.

Procedures

1. Choose CH MODE from [MENU] -> DIAGNOSTICS -> FOR SERVICE -> OTHER menu.

2. Set CH MODE.
   - INT : To conform to INT (international) channel.
   - USA : Of the INT channel list, CH1002, 1004, 1060 and 1062 are unable to be used. In addition, CH1067, 2067, 1013 and 2013 become forcibly 1 W-operated. If any of the above channels is designated by shore-based AIS in USA channel mode, the designated channel is ignored.

3.6 Regional operating channels Setting

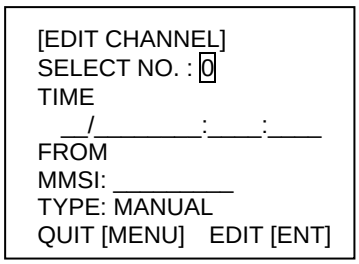
You may display the status of regional operating areas currently retained in the equipment memory. Nine of any combination of AIS message from shore-based AIS, DSC message, manual settings and commands from ECDIS or a PC may be registered and one will be HIGH SEA.

Setting is carried out on the [MENU] -> CHANNEL SETTINGS -> EDIT CHANNEL.

1. About registering areas

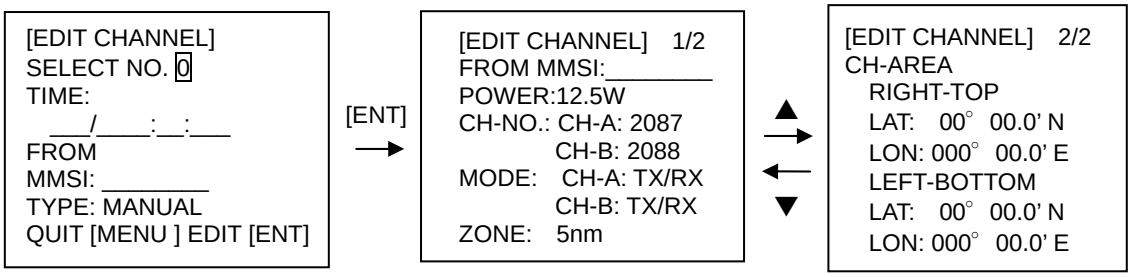
1) Data registered from AIS and DSC messages registered within last two hours cannot be edited.
2) If the registered items, those labeled [HIGH SEA] cannot be edited ([HIGH SEA] are data used for international waters not controlled by shore-based AIS).
3) If two areas overlap one another the older data is deleted.
4) Data older than five weeks is deleted.
5) Area data is deleted when it is more than 500 miles from the area for which it was registered.

2. EDIT CHANNEL



- SELECT NO. : File number covers 0 to 9
  - No. 0; For manual EDIT CHANNEL setting
  - No. 1; Current Region operation information appears
  - No. 2; Next candidate Region operation
  - No. 3 and after; Appears closest to the own ship in order
- TIME : Date and time of the registered data is displayed.
- MMSI : When controlled by DSC or shore-based AIS, its MMSI No. is displayed.
- TYPE : The controlled method is displayed.
  1) HIGH SEA (in the case of default setting)
  2) AIS (when controlled by AIS message)
  3) PI (when controlled by ACA sentence from PC or ECDIS)
  4) DSC (when controlled by DSC)
  5) MANUAL (when entered manually using PFEC sentence from MKD or PC-MDK)

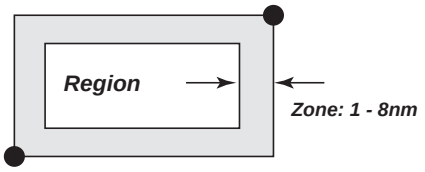
3. Setting of registering areas by manual.



- POWER : Registered output power is displayed. In addition, output power can be selected 2 or 12.5 W.
- CH-NO. : Registered channels are displayed. In addition, channels can be edited.
- MODE : Registered modes are displayed. In addition, modes can be edited.

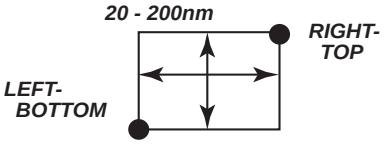
CH-A	TX/RX	TX/RX	RX	RX	RX	UNUSE
CH-B	TX/RX	RX	TX/RX	RX	UNUSE	RX

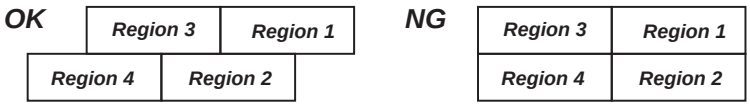
- ZONE : Registered ZONE (channel transitional zone) is displayed. In addition, ZONE can be edited. Settings are made in the range from 1 to 8 nm.



ZONE is the inside of the designated Region.

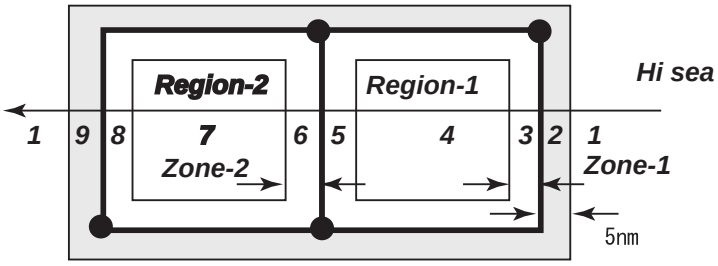
- CH-AREA : Registered Region is displayed. In addition, the Regional areas can edit. For setting, two geographic coordinates are designated. The range is 20 to 200 nm. The available range is 20 to 200 nm. If the area contains overlapping data the older data will be erased.





Reference: Transitional Mode Operations

The AIS automatically switches to the two-channel transitional operating mode when it is located within five nautical miles of a regional boundary. In this mode the AIS transmits and receives on the primary AIS frequency specified for the occupied region and also transmits and receives on the primary AIS frequency of the nearest adjacent region.



Region operation begins 5 nm before the ship enters the Region from High-sea.

The channel transition takes place as follows when the channel is operated as described in the table below.

	AIS CH-1 (Primary CH)	AIS CH-2 (Secondary CH)
Region-1	CH A-1	CH B-1
Region-2	CH A-2	CH B-2
High-sea	AIS-1 (CH2087)	AIS-2 (CH2088)

Region	AIS Channel	
	Primary CH	Secondary CH
1	AIS-1	AIS-2
2	AIS-1	CH A-1
3	CH A-1	AIS-1
4	CH A-1	CH B-1
5	CH A-1	CH A-2
6	CH A-2	CH A-1
7	CH A-2	CH B-2
8	CH A-2	AIS-1
9	AIS-1	CH A-2
1	AIS-1	AIS-2

When the AIS is entering the transitional mode, it continues to utilize the current channels for transmitting for a full one-minute frame while switching one of the receivers to the new channel. The TDMA access rules is applied to vacating slots on the current channel and accessing slots on the new channel. This transitional behavior is made only when the channels are changing.

3.7 USER SETTINGS

On [MENU] -> USER SETTINGS, the following settings are carried out.

Table 3.7.1 USER SETTINGS Menu

Item	Setting	Description
KEY BEEP	ON/OFF	ON/OFF setting of beep sound when panel keys are operated.
ALARM BUZZER	ON/OFF	ON/OFF setting of beep sound when alarm is initiated. To stop buzzer, pressing any keys or turn ON ALM ACK signal.
DISP RCVD MSG	ALL/ABM/OFF	ALL: Controls display of incoming call notice popup (MESSAGE!) irrespective of kind of messages. ABM: Controls display of incoming call notice popup (MESSAGE!) when Safety, Binary messages to the own ship are received. OFF: Incoming call notice popup (MESSAGE!) of all the received messages are not displayed. ***Note:*** In any of all the above settings, the received messages are stored in [MENU] -> MSG -> RX LOG.
RCVD MSG BUZZ	ON/OFF	Controls whether or not the buzzer is sounded when a message is received. ***Note:*** Setting of incoming call notice popup (MESSAGE!) display is the setting of the above DISP RCVD MSG.
LR MODE	AUTO/MANUAL	Setting whether the request from “Long Range” is returned automatically or manually.
CPA/TCPA ALAM	CPA: 6.00 nm (0 – 6 nm)	CPA limit is set. The target that comes within this setting is considered a Dangerous Target. CPA set in this section is not related to the radar side.
	TCPA: 60 min (0 – 60 min)	TCPA is set. The target that comes within this setting is considered a Dangerous Target. TCPA set in this section is not related to the radar side.
	ALARM MODE: ON/OFF	Controls whether or not popup (COLLISION ALARM) is displayed when Dangerous Target is detected.
	ALARM BUZZER: ON/OFF	ON/OFF setting of the alarm sound when Dangerous Target is detected.

3.8 Connecting a Second FA-1502 Connecting

A second FA-1502 can be connected to COM2 or COM3 port. The same operation is applied to both the first and the second units and there is no priority to operation. [MENU] -> USER SETTINGS can be independently set, respectively. However, setting of LONG RANGE should be excluded.

1. Connection

Connect the first FA-1502 to [DISP] port and the second FA-1502 to COM-2 or COM-3 port. Connect power supply control line: SW-H, C of the second FA-1502 in parallel with power supply control line: DISP SW+(#7), DISP SW-(#8) of DISP port of the first FA-1502.

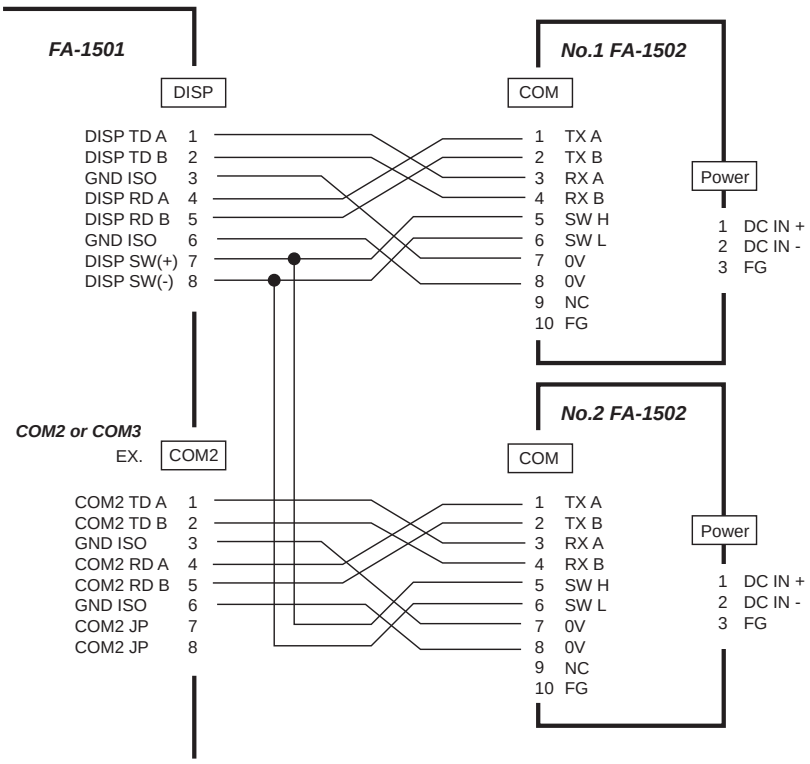


Fig. 3.8.1 Connection of No. 2 FA-1502

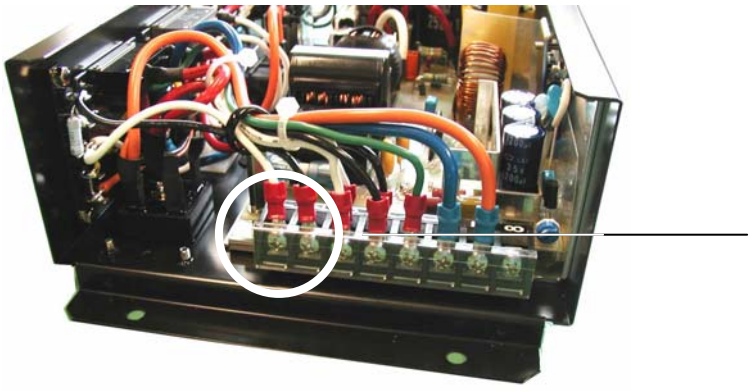
2. Setting

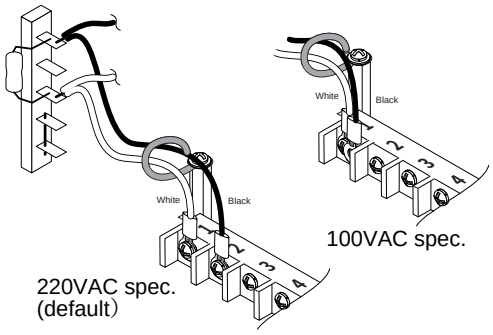
Set MODE of connection port: COM2 or COM3 to “MONITOR” and Speed to “38.4 kbps.”

3.9 PR-240 input voltage modification

PR-240 is shipped for 220 VAC power input. Changing between 230 VAC and 115 VAC is made as shown below. No soldering is required.

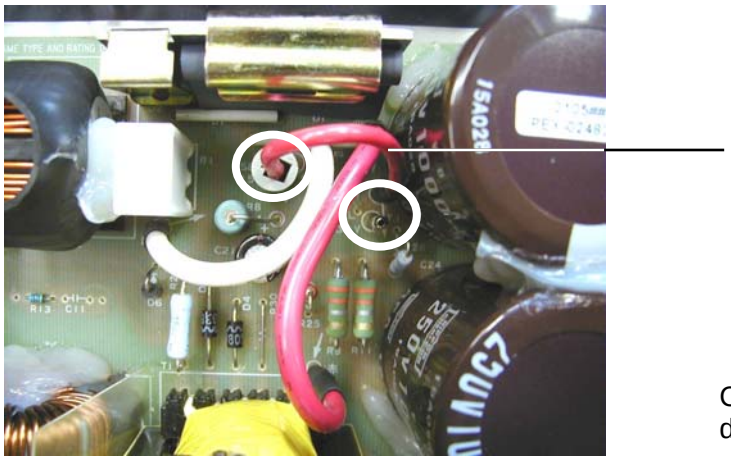
Step 1. Changing tap connection

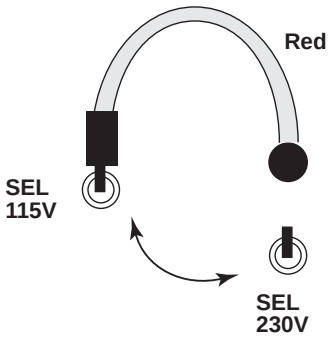




The white wire is connected to #1 and the black #2 in 220 VAC sets. Both white and black wire are connected to #1 in 115 VAC sets.

Step 2. Changing jumper connection





Change the connection of red wire depending on ship's mains.

4.1 [DISP]

Each time the [DISP] key is pressed, the display changes in the sequence shown below. In the “TARGET LIST” screen, choose the target and then press the [ENT] key, so, you can view the detailed target data.

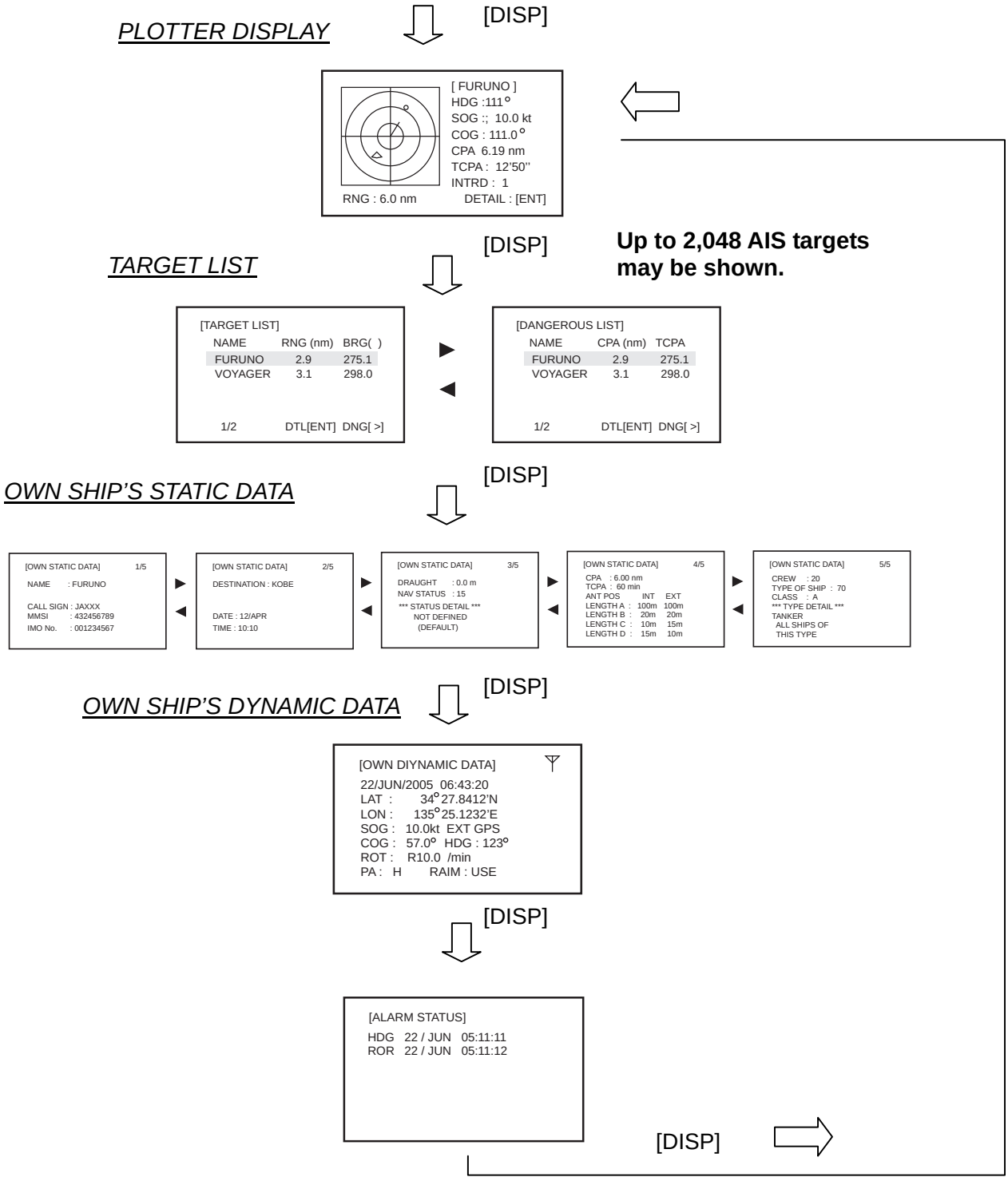
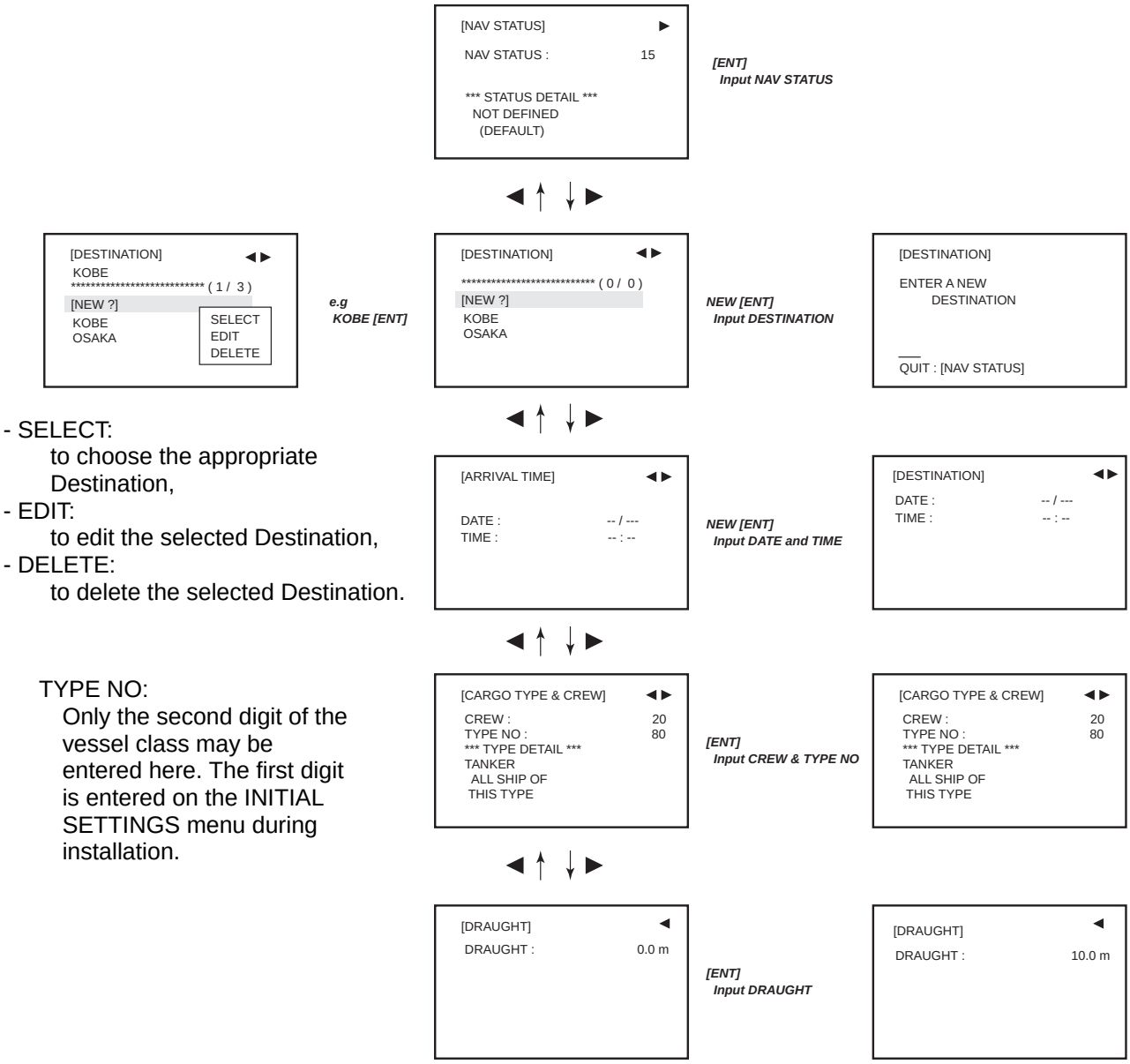


Fig. 4.1.1 [DISP] screen sequence

4.2 [NAV STATUS]

There are five items on the NAV STATUS menu that you will need to enter at the start of a voyage: [NAV STATUS] (navigation status), [DESTINATION], [ARRIVAL TIME] (arrival date and time), [CARGO TYPE & CREW] (number of crew and vessel type) and [DRAUGHT].
This information should be updated as required.



- SELECT:
  to choose the appropriate Destination,
- EDIT:
  to edit the selected Destination,
- DELETE:
  to delete the selected Destination.

TYPE NO:
Only the second digit of the vessel class may be entered here. The first digit is entered on the INITIAL SETTINGS menu during installation.

Fig. 4.2.1 [NAV STATUS] screen sequence

4.3 [MENU]

[MENU]	Menu-1	Menu-2	Menu-2	Menu-3
MSG	CREATE MSG	SET MSG TYPE	ADDRESS TYPE:	BROAD CAST/ADRS CAST
			MMSI:********	***Note:*** When selected ADRS CAST
			MSG TYPE:	SAFETY/ NORMAL
			CHANNEL	ALTERNATE/BOTH A & B/A/B
		SET MSG	[SET MSG] e.g: DE FURUNO -------	***Note:*** - ADRS CAST SAFETY : 156 character Normal : 151 character - BROAD CAST SAFETY : 161 character Normal : 156 character
		SEND MSG	SEND MESSAGE.	ARE YOU SURE? YES/NO
	TX LOG (Max. 20)	[TX LOG] Date/Time/OK or FAIL/TO/MSG. e.g. select Tx log form list 24/APR 14:11 FAIL TO: 432000011 S-ABM	Sent Message appears	
	RX LOG (Max. 20)	[RX LOG] Date/Time/OK or FAIL/TO/MSG. e.g: select Tx log form list 24/APR 14:11 FAIL TO: 432000011 S-ABM	Received Message appears	
SENSOR STATUS	[SENSOR STATUS] e.g: EXTRL DGNSS EXTRL SOG/COG HDT VALID OTHER ROT			

INTERNAL GPS	[INTERNAL GPS] LAT: xx° xx. xxxx'x LON: xxx° xx. xxxx'x SOG: 0.0 - 999.9 kt) COG: 0.0 - 359.0°) UTC: dd:mmm:yyyy hh:mm:ss GPS STS: DGPS/ NO FIX/ 2D/3D/D2D/ D3D/DOP/ NO FIX PA: H/L RAIM: USED/UNUSED			
USER SETTINGS	KEY BEEP	ON/OFF		
	ALARM BUZZER	ON/OFF		
	DISP RCVD MSG	ALL/ABM/OFF		
	RCVD MSG BUZZ	ON/OFF		
	LR MODE	AUTO/MANUAL		
	CPA/TCPA ALAM	CPA	6.00 nm (0 – 6 nm)	
		TCPA	60 min (0 – 60 min)	
		ALARM MODE	ON/OFF	
		ALARM BUZZER	ON/OFF	
INITIAL SETTINGS Password: ENT->ENT *Cont'd*	VIEW MMSI	MMSI: X_1 ---- X_9 IMO NO: X_1 ---- X_9 NAME: Max. 20 character C.SIN: Max. 7 character		
	VIEW INT ANT POS.	A (0-511 m) /B (0-511 m) C (0-63 m) /D (0-63 m)		
	VIEW EXT ANT POS.	A (0-511m) /B (0-511 m) C (0-63 m) /D (0-63 m)		
	VIEW SHIP TYPE	TYPE NO: x*		

INITIAL SETTINGS	VIEW I/O PORT	VIEW COM PORT	[VIEW COM1] MODE: LONG RANGE SPEED: IEC61162-2	
			[VIEW COM2] MODE: EXT DISPLAY SPEED: IEC61162-2	
			[VIEW COM3] MODE: MONITOR SPEED: IEC61162-2	
			[VIEW COM4] MODE: SENSOR SPEED: IEC61162-1	
			[VIEW COM5] MODE: SENSOR SPEED: IEC61162-1	
			[VIEW COM6] MODE: SENSOR SPEED: IEC61162-1	
		VIEW PC PORT	[VIEW PC PORT] MODE: MONITOR SPEED: 38.4KBPS	
		VIEW LAN PORT	[VIEW LAN PORT] MODE: DISABLE IP ADDRESS: 172.031.024.001 SUB NET MASK: 255.255.000.000 PORT NO.: 10000	
		VIEW PRIORITY	[VIEW PRIORITY] L/L, COG, SOG	COM4: 1 / COM5: 2 / COM6: 3
			[VIEW PRIORITY] HDG	COM4: 2 / COM5: 3 / COM6: 1
			[VIEW PRIORITY] ROT	COM4: 2 / COM5: 3 / COM6: 1

INITIAL SETTINGS Enter Password: xxxxxx *Cont'd*	SET MMSI	MMSI: X_1 ---- X_9 IMO NO: X_1 ---- X_9 NAME: Max. 20 character C.SIN: Max. 7 character		
	SET INT ANT POS.	A(0-511 m) / B(0-511 m) C(0-63 m) / D(0-63 m)		
	SET EXT ANT POS.	A (0-511 m) / B(0-511 m) C(0-63 m) / D(0-63 m)		
	SET SHIP TYPE	0 * NOT AVAILABLE		
	SET I/O PORT *Cont'd*	SET COM PORT *Cont'd*	[SET COM1] MODE: SPEED:	MODE: LONG RANGE/EXT DISPLAY/ DISABLE
				SPEED: IEC61162-1/IEC61162-2
			[SET COM2] MODE: SPEED:	MODE: EXT DISPLAY/MONITOR HI LEVEL IF/DISABLE
				SPEED: IEC61162-1/IEC61162-2
			[SET COM3] MODE: SPEED:	MODE: EXT DISPLAY/MONITOR HI LEVEL IF/DISABLE
				SPEED: IEC61162-1/IEC61162-2
			[SET COM4] MODE: SPEED:	MODE: SENSOR/EXT DISPLAY DISABLE
				SPEED: IEC61162-1/EC61162-2
			[SET COM5] MODE: SPEED:	MODE: SENSOR
				SPEED: IEC61162-1 IEC61162-2

INITIAL SETTINGS	SET I/O PORT	SET COM PORT	[SET COM6] MODE: SPEED:	MODE: SENSOR
				SPEED: IEC61162-1/IEC61162-2
		SET PC PORT	[SET PC PORT] MODE: SPEED:	MODE: STANDERD/MONITOR/SERVICE/ BEACON/DISABLE
				SPEED: 4800/9600/19.2KBPS/38.4KBPS/ 57.6KBPS
		SET LAN PORT	[SET LAN PORT] MODE IP ADDRESS SUB NET MASK PORT NO.	MODE STANDERD/MONITOR/SERVICE/ DISABLE
				IP ADDRESS: 172.031.024.001 SUB NET MASK: 255.255.000.000 PORT NO. : 10000
		SET PRIORITY	[SET PRIORITY] L/L, COG, SOG	L/L, COG, SOG COM4: 1, 2, 3 / COM5: 1, 2, 3 COM6: 1, 2, 3
			[SET PRIORITY] HDG	HDG COM4: 1, 2, 3 / COM5: 1, 2, 3 COM6: 1, 2, 3
			[SET PRIORITY] ROT	ROT COM4: 1, 2, 3 / COM5: 1, 2, 3 COM6: 1, 2, 3

CHANNEL SETTINGS	VIEW CHANNEL	[VIEW CHANNEL] POWER : 1 W/2 W/12.5 W CHANNEL NO. : CH-A: 2087 CH-B: 2088		
	EDIT CHANNEL	[CHANNEL EDIT] SELECT NO. (0) TIME dd/mmm hh:mm FROM MMSI: --------- TYPE: HIGH SEA/AIS/PI/ DSC/MANUAL ***Note:*** No.0: For Edit Channel No.1: Current Channel No.2 – 9: Edited Channel	[CHANNEL EDIT] 1/2 FROM MMSI: ---------- POWER: 2 W/12.5 W CH NO. CH-A: 2087 CH-B: 2088 MODE CH-A: TX/RX, RX, UNUSED CH-B: TX/RX, RX, UNUSED ZONE: 5 nm (1-8 nm) [CHANNEL EDIT] 2/2 CH AREA RIGHT TOP LAT: 0° 00.0’N/S LON: 0° 00.0’E/W LEFT BOTTOM LAT: 0° 00.0’N/S LON: 0° 00.0’E/W	

DIA-GNOSTICS *Cont'd*	MONITOR TEST	[MONITOR TEST] BOOT NO. : 2450020-01.02 PROG NO. : 2450021-01.0x ROM : OK CONT : xx SDRAM : OK DIM : x PORT : OK KEY :		
	TRANSPONDER TEST	[TRANSPONDER TEST] MEMORY TEST	[MEMORY TEST] PROGRAM NO. 2450018-01.0x MAIN ROM : OK/NG MAIN RAM : OK/NG SUB RAM : OK/NG	
		GPS TEST	[GPS TEST] PROGRAM NO. 4850264005 TEST : OK/NG (NG List)	
	PWR ON/OFF HISTORY	[PWR ON/OFF HISTORY] PWR-ON dd/mm/yyyy Time PWR-OFF dd/mm/yyyy Time		
	TX ON/OFF HISTORY	[TX ON/OFF HISTORY] TX-ON dd/mm/yyyy Time TX-OFF dd/mm/yyyy Time		
	MEMORY CLEAR	[MEMORY CLEAR] MONITOR CLEAR SET USER DEFAULT GPS COLD START	ARE YOU SURE? YES NO	

DIA- GNOSTICS	FOR SERVICE Password: Up key -> Down key ->Left key -> Right key -> NAV -> DIM -> DISP -> ENT -> MENU -> NAV *Cont'd*	CH & PWR SETTINGS	[CH & PWR SETTINGS] POWER : 0 W/1 W/2 W/12.5 W CH NO. CH-A : xxxx CH-B : xxxx MODE : CH-A : TX/RX//RX//UNUSED CH-B :: TX/RX//RX//UNUSED CH SET : AUTO/MANUAL	
		TX TEST	[TX TEST] PATTERN: PN_PATTERN/TYPE 1/ TYPE 2/DSC 1[Y]/DSC 2[B]/ DSC 3[BY]/TXF TX START [DIM] TX STOP [MENU]	
		RX TEST	[RX TEST] RX1 : OK/NG RX2 : OK/NG DSC : OK/NG	
		I/O PORT TEST	IEC PORT TEST	[IEC PORT TEST] COM1: OK/NG/COM2: OK/NG COM3: OK/NG/COM4: OK/NG COM5: OK/NG/COM6: OK/NG PC: OK/NG
			NMEA PORT TEST	[NMEA PORT TEST] COM4: OK/NG/COM5: OK/NG COM6: OK/NG
			AD-10 PORT TEST	[AD-10 PORT TEST] AD10 : OK/NG
		ALARM HISTORY	[ALARM HISTORY] "ALARM LIST"	e.g: MKD 22/JUN 01:49:10

DIA-GNOSTICS	FOR SERVICE	I/O MONITOR	COM1/ COM 2 COM 3 COM 4/COM 5/ COM6/PC/GPS	[xxx MONITOR] e.g: $PFEC,AI----------
		OTHER	SIM MODE	OFF/1/2
			ALARM MODE	CONTINUOUS/KEY STOP
			CH MODE	INT/USA
			ALL CLEAR	ARE YOU SURE? YES NO
			DEBUG MENU	[CPU VERSION] 2450018-01.0x MAIN: 01.01.B1 200507061623 SUB : 01.01 200504151523 FPGA : 01.0F 000000000000
				[A/D MONITOR] VF : xxx / VR : xx / REF : xxx
				[SS/SN MONITOR] RX1_SS : xx / RX2_SS : xx DSC_SS : xx RX1_SN : xx / RX2_SN : xx DSC_SN : xx
			SILENT MENU *NOTE*	***ON/OFF***
			CHECK SUM *NOTE*	***CHECK/UNCHECK***

NOTE:

- Call up the SILENT MENU and CHECK SUM;

1. Turn ON Power while press [MENU] and [ENT] key, then input the Password. (See page 4-10, 8-19)

2. Call up; FOR SERVICE -> OTHER -> SILENT MENU: ON

- How to call up the "SELECT MODE";

Press [DIM] key, until "SELECT MODE" appears

5.1 Overall Block Diagram

5.1.1 Overall block diagram

FA-150 consists of FA-1501 Transponder unit, FA-1502 Monitor unit and VHF/GPS Antennas.

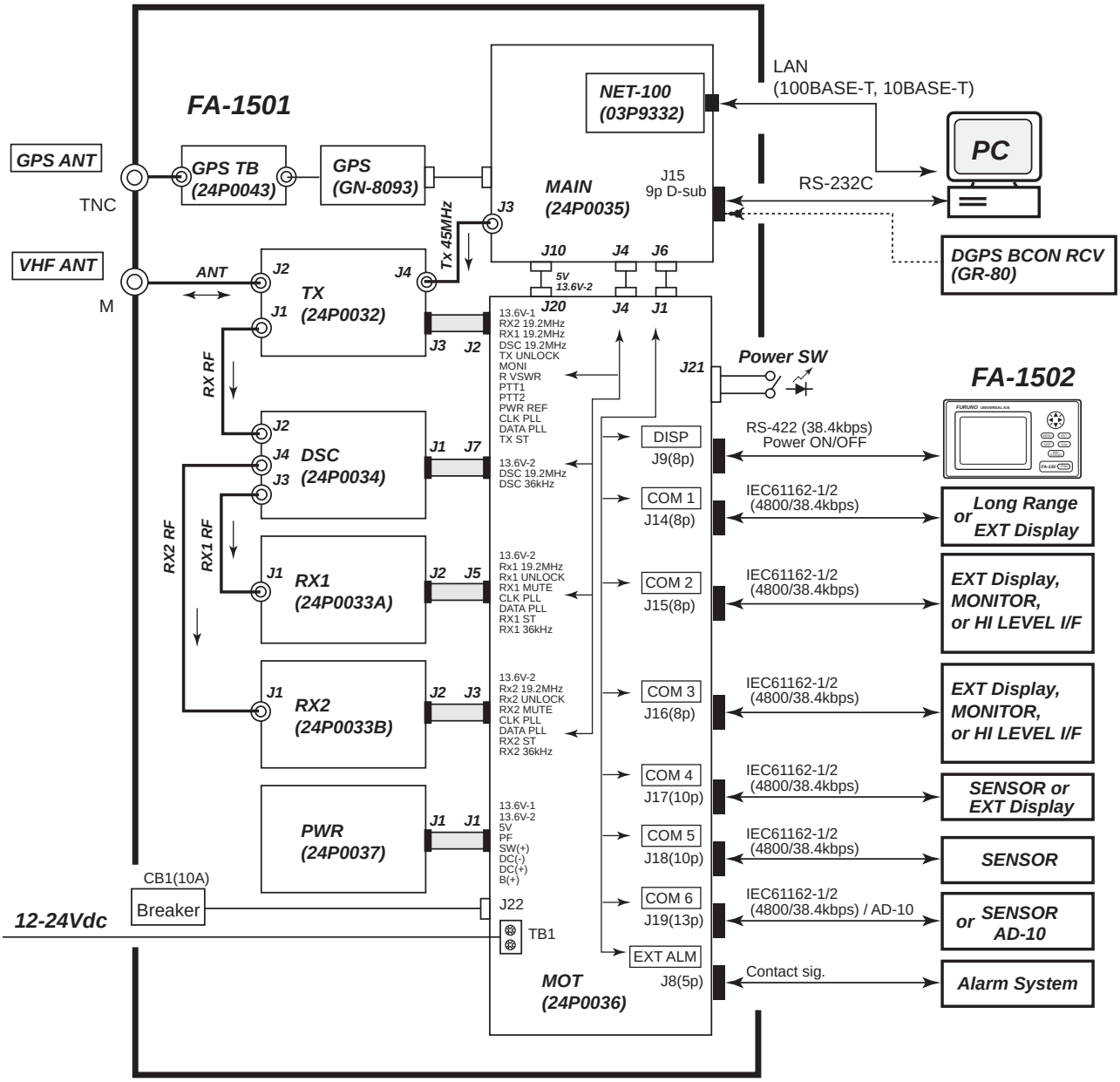
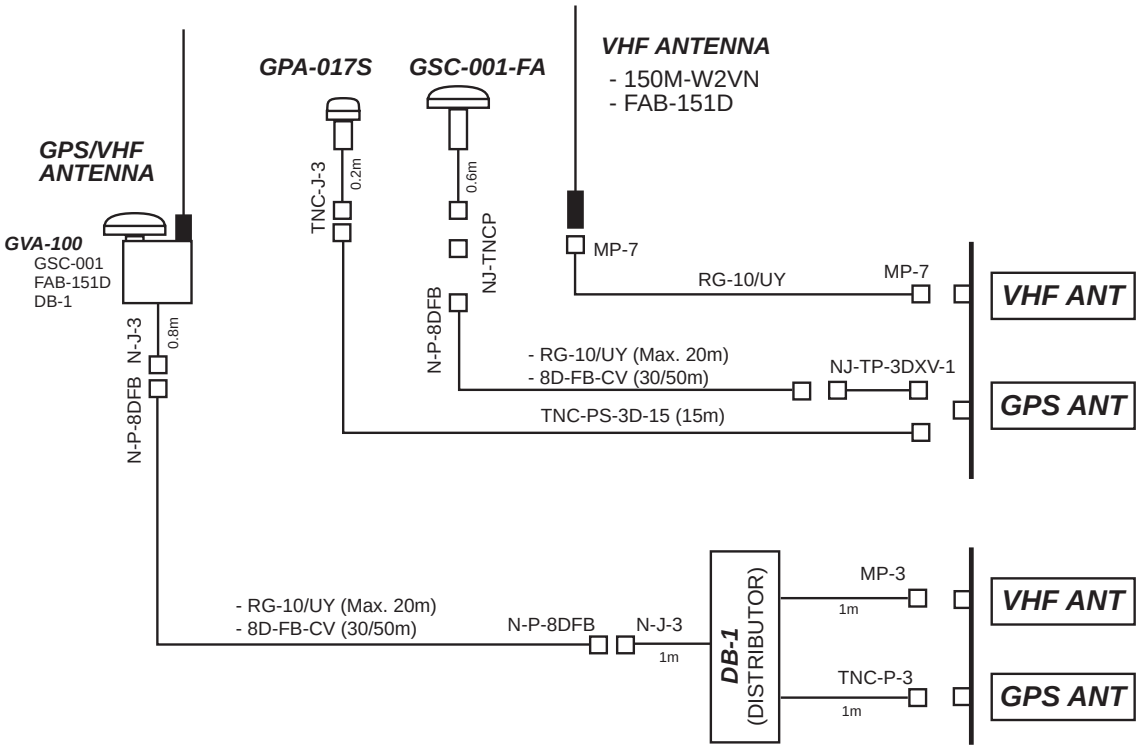


Fig. 5.1.1 FA-1501 Block diagram



VHF antenna	GPS antenna	GPS/VHF combined antenna
FAB-151D	GSC-001	GVA-100 + FAB-151D + DB-1
150M-W2VN	GPA-017S	

Fig. 5.1.2 FA-150 VHF/GPS Antenna system

5.1.2 Outline of Board

1. FA-1501

Table 5.1.1 FA-1501 outline

Board name	Outline
MAIN (24P0035)	Consists of MAIN CPU, SUB CPU, and its peripheral circuits. Controlling/processing of AIS (DSC) communications and I/O interfacing are done by the MAIN CPU. Processing of TDMA/DSC modulation/demodulation and the analog-interfacing with the radio part are done by the SUB CPU.
TX (24P0032)	GMSK-modulated signal of 45 MHz is input from the MAIN board and up-converted into the transmitting frequency and power-amplified. RF power module (HPA) U1 (RA35H1516M) amplifies the transmitting frequency into 12.5 W.
DSC (24P0034)	DSC receiving signal is down-converted into the 36 kHz IF signal. The receiving frequency is CH70: 156.525 MHz.
RX1 (24P0033A)	AIS receiving signal (TDMA) is down-converted into the 36 kHz IF signal. Circuit configuration is almost same as those for RX2 board. Basically receiving frequencies of CH-A (Primary channel) are allocated for RX1 board. ***Note:*** Not compatible with RX2 board, because the 1st IF frequency is not the same.
RX2 (24P0033B)	AIS receiving signal (TDMA) is down-converted into the 36 kHz IF signal. Circuit configuration is almost same as those for RX1 board. Basically receiving frequencies of CH-B (Secondary channel) are allocated for RX2 board. (Also see above note.)
PWR (24P0037)	Consists of the switching regulators to convert the input voltages of +12 to +24 VDC to +13.6 VDC x 2 and +5 VDC for use in each board.
MOT (24P0036)	Mother board for MAIN, RX1, RX2, DSC and PWR boards. And external equipment such as sensors and radars are connected to the terminals of the board.
GPS (GN-8093)	GPS module for receiving the GPS signal of L1: 1575.42 MHz. Number of receiving channels is 12 parallel (12-satellite tracking).
GPS TB (24P0043)	For relaying the GPS receiving signal.

2. FA-1502

Table 5.1.2 FA-1502 outline

PCB name	Outline
CPU (24P0062)	AIS information display (MKD) and the system setting-up. Communications interface of RS-422 with FA-1501 are conducted at 38.5 kbps data rate.

5.2 FA-1501 Block Description

5.2.1 TX Board (24P0032)

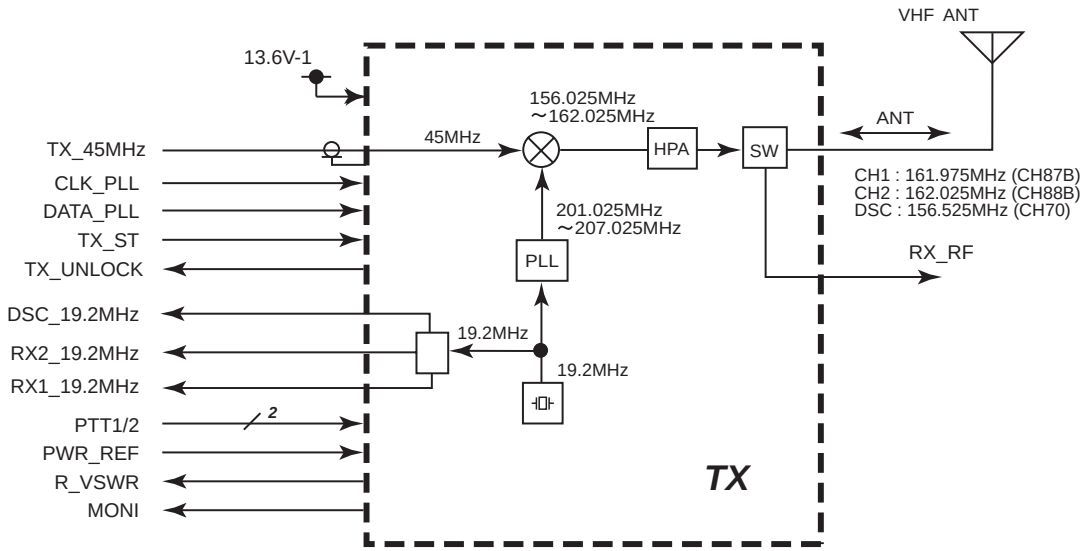


Fig. 5.2.1 Outline of TX board

The TX board consists of the reference oscillator, frequency converter, TX PLL, power amplifier and TX/RX antenna switching circuits.
The GMSK-modulated TX signal of 45 MHz input from MAIN board is up-converted to the TX signal of 150 MHz band and then amplified into 12.5 W in the HPA module.
Reference oscillation frequency of 19.2 MHz is used for the TX board, and also as the PLL reference oscillation frequency for DSC, RX1 and RX2 boards.

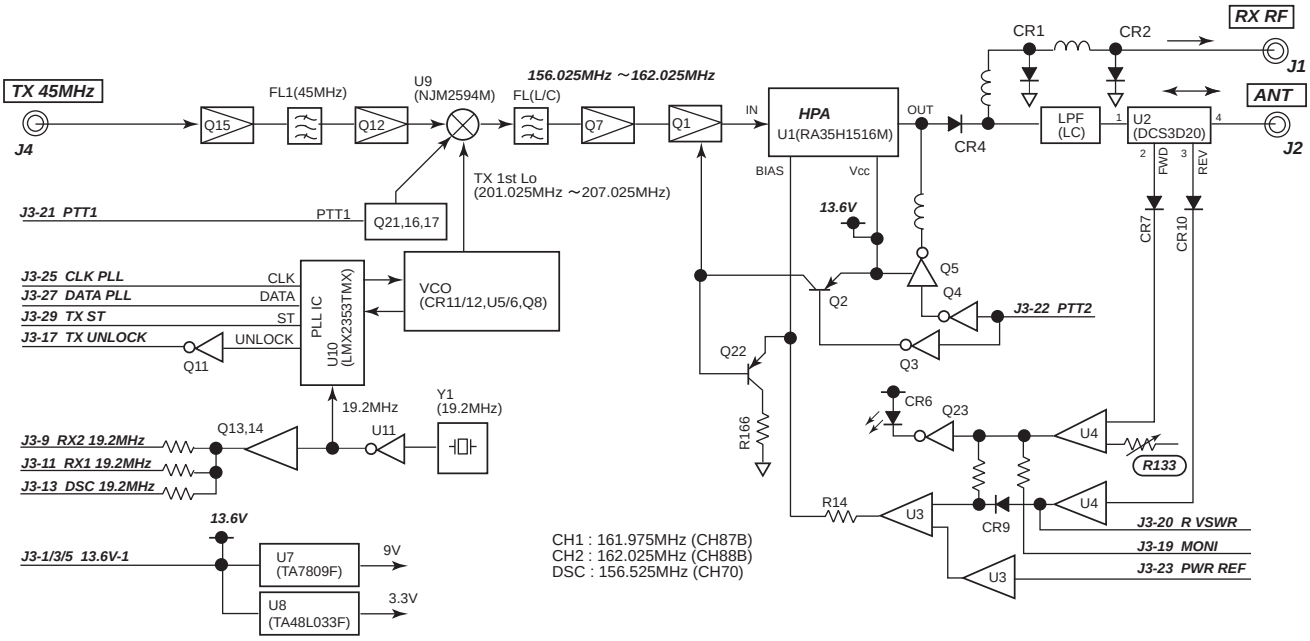


Fig. 5.2.2 Block diagram of TX board

The GMSK-modulated TX signal of 45 MHz (-30 dBm) coming from MAIN board is input to U9 (frequency converter) via Q15, FL1 and Q12. FL1 is a BPF (Passband width: ±10 kHz), and reduces the spurious components included in the TX modulated signals.

At U9, the TX 45 MHz modulated signal is mixed with the 1st Local oscillation frequency of 201.025 MHz to 207.025 MHz, and then converted to the transmitting frequency of 156.025 MHz to 162.025 MHz. Next stage of FL (L/C) is the BPF with the L/C circuits, reducing the spurious components generated by the frequency conversion.

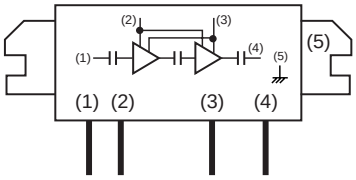
U1 is an HPA module (RA35H1516M), amplifying the input signal with about +10 dBm up to 12.5 W ±1.5 dB.

Note:

TX power tolerance: ±1.5 dB for 12.5 W/2 W

RA35H1516M

(154 MHz to 162 MHz, 40 W RF MOS-FET AMP Module)



(1): RF Input(Pin)
(2): Gate Voltage(V_{GG})
(3): Drain Voltage(V_{DD})
(4): RF Output(P_{out})
(5): RF Ground(Case)

V_{DD} = 12.5 V, V_{GG} = 5 V,
Where Pin = 50 mW,
Output: 40 W or more,
Efficiency: 50 % or more.
2nd harmonics: -50 dBc or less.

TX spurious components output from HPA is reduced by the LPF (L/C). The intensity of the spurious radiation is suppressed down to the level of -77 dB (0.25 μW) or less through the stages of the HPA and LPF.

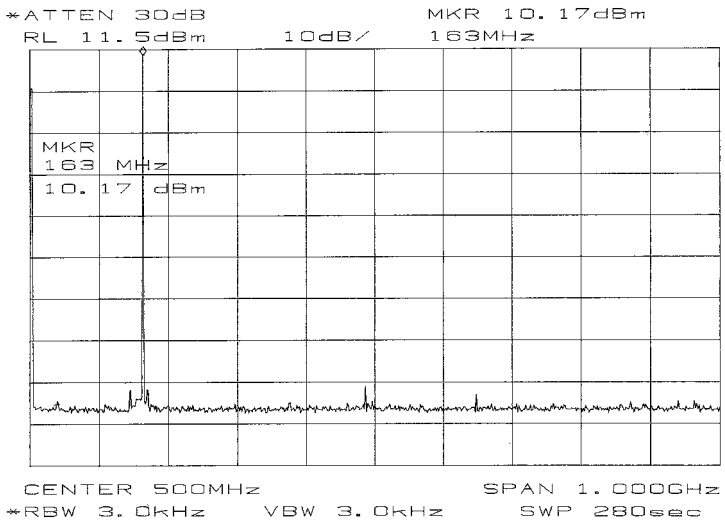


Fig. 5.2.3 TX spectrum

And then TX signal is forwarded to VHF ANT terminal via U2 CM coupler.
Y1 is a 19.2 MHz reference oscillator for PLL circuit in the TX board with the accuracy of ±1 ppm for maintaining TX frequency tolerance within the limit of ±3 ppm (±450 Hz).

Main Control and Detection signals

PWR REF

For setting up the TX power output to 0 W, 1 W, 2 W or 12.5 W.
The level setting of TX power output is done by controlling the BIAS level of the HPA by using the FWD signal from U2 and the PWR REF signal.
TX power is set to 12.5 W by adjusting the potentiometer: R133 when TX power selection of 12.5 W is made.
(See Fig. 5.2.2.)

R VSWR

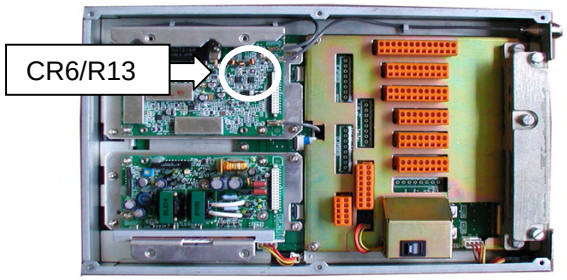
Detects the reflected (reverse) voltage (REV) from U2 CM Coupler.
The error message “ANT” appears for announcing the abnormality of the VHF ANT circuits when the ratio of VSWR reaches 3 or above.
VSWR is converted from the voltages of R-VSWR, not calculated from both of F-VSWR and R-VSWR.

MONI

Detects the forward wave voltages (MONI) from U2.
The error message “TX” appears for announcing the TX abnormality when the voltages fall below the specified limit during TX operation.
Voltage limits (output power) are as follows:

- 0.25 W or less for TX power of 1 W,
- 0.7 W or less for 2 W,
- 4 W or less for 12.5 W.

And also the error message “TX” appears when the MONI voltages are detected during no TX operation.



TX monitor of LED CR6 goes on during TX operation.

Note:

Relation between R-VSWR and MONI voltages

TX power	**12.5 W**	**2 W**
R VSWR voltage	+0.3 VDC to +0.5 VDC	+0.2 VDC to +0.5 VDC
MONI voltage	+1.6 VDC to +2.0 VDC	+0.6 VDC to +1.0 VDC

PTT1, PTT2

PTT1 signal controls U9, and also PTT2 does HPA peripheral circuits. Both are control signals for switching TX/RX and controlled with the same timing.

TX UNLOCK

The error message “TX” appears for announcing the TX abnormality when the TX PLL circuits operation becomes unlocked.
VCO control voltages of TP1 are +3.5 VDC to +5.0 VDC for the TX frequency of 156.026 MHz and +5.0 VDC to +6.0 VDC for 161.975 MHz.

Distribution of 19.2 MHz Reference Oscillation frequency of Y1

19.2 MHz reference oscillation frequency of Y1 (TCXO: Temperature Compensated Crystal Oscillator) on TX board is distributed to RX1 and RX2 boards as the reference of the PLL circuits and to DSC board as the reference to generate the 2nd local oscillation, in addition to TX board.

Frequency adjustment is not necessary for Y1.

If the tolerance of the VHF TX frequency is exceeded by ±3 ppm or more, replace the TX board.

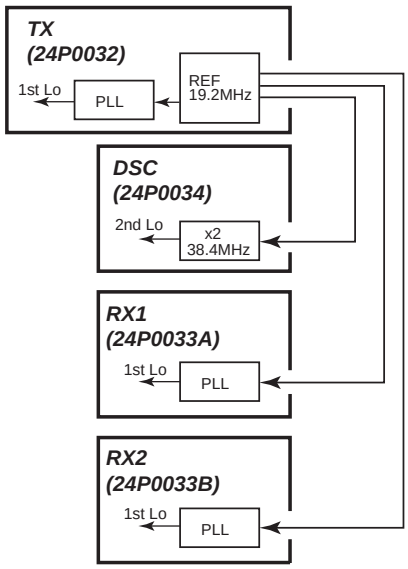


Fig. 5.2.4 Distribution of 19.2 MHz Reference oscillation frequencies

5.2.2 RX-1 (24P0033A) and RX-2 (24P0033B) Boards

Down-converts the AIS receiving signal (TDMA) to 36 kHz IF signal.
Circuits including RX1 and RX2 boards are almost the same except for the 1st IF and 2nd local oscillation frequencies. Receiving frequencies of CH-A are allocated for RX1 board and CH-B for RX2. So, note that both are not compatible.

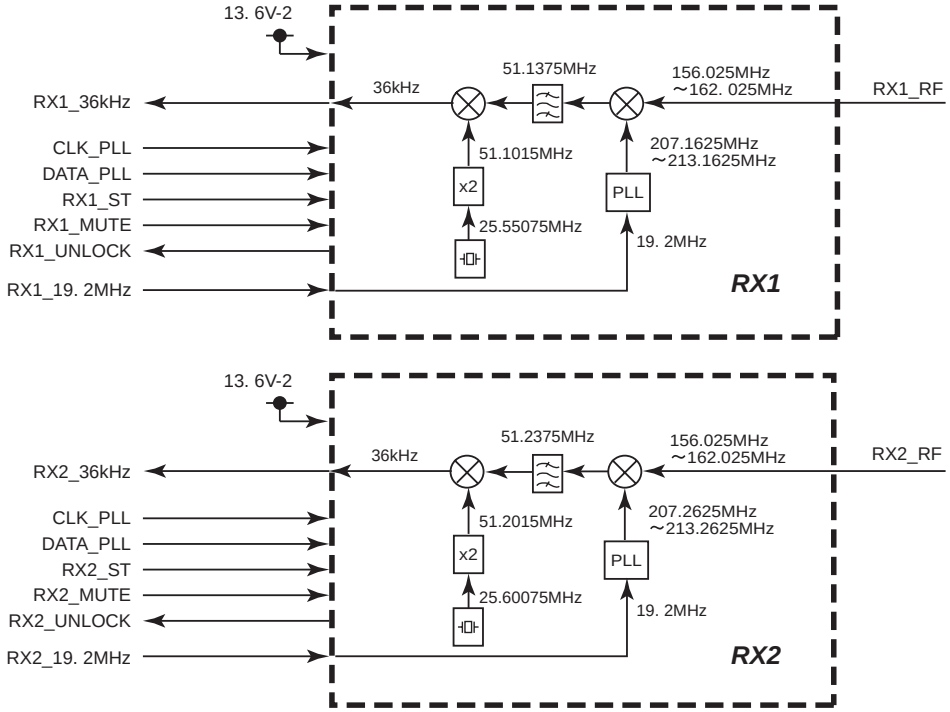


Fig. 5.2.5 Outline of RX1 and RX2 boards

Note: Correspondence between RX1/2 Boards and CH-A /-B

The Channels displayed when you open the VIEW CHANNEL screen by the key entry of [MENU] -> CHANNEL SETTINGS are indicated as the primary channel for CH-A and as the secondary channel for CH-B.

And on the EDIT CHANNEL screen selected by the key entry of [MENU] -> CHANNEL SETTINGS, the channel manually registered for CH-A corresponds to the primary channel and RX1 board, and for CH-B to the secondary channel and RX2 board.

In the regional operating area where the channels are automatically set by AIS (MSG. 22) or DSC message, and automatically switched from the primary to the secondary and vice versa in the transitional zone, note that the correspondence between the RX1/2 boards and CH-A /-B would be changed.

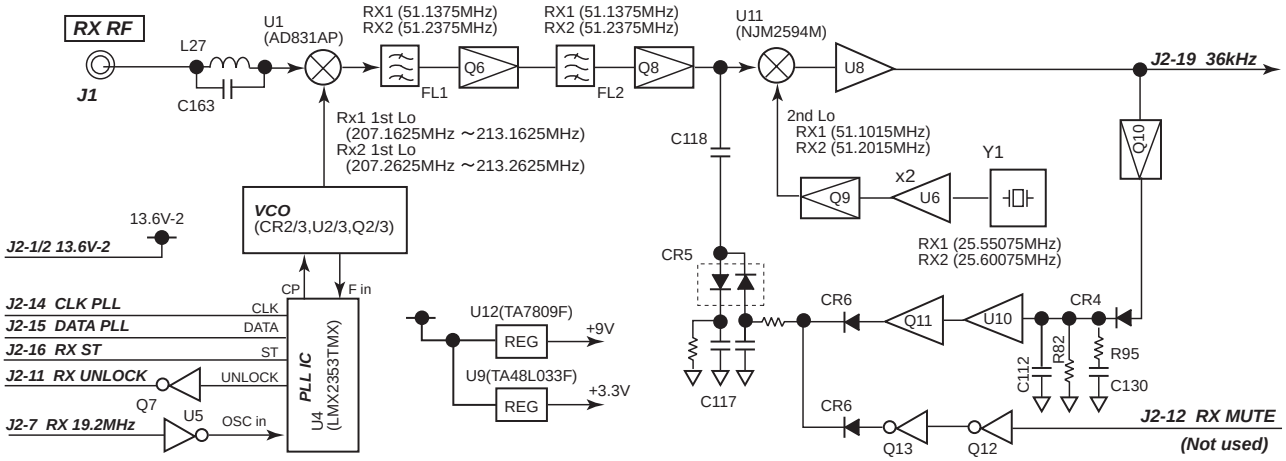


Fig. 5.2.6 Block diagram of RX1, RX2 boards

AIS receiving signal (TDMA) is fed to U1 via L27 and C163.
L27 and C163 are composing the 200 MHz band-trap filter for eliminating the leakage of the 1st local frequency components toward the terminal of [RX RF]. At U1, 150 MHz AIS receiving signal is mixed with the 1st local frequency components of 207 MHz to 213 MHz, and down-converted to 51 MHz 1st IF signal.
FL1 and FL2 following U1 are the BPFs (Passband width: ±4.5 kHz for FL1, ±10 kHz for FL2) and are reducing the spurious components generated with the frequency conversion.

Y1 is the 25.55075 MHz reference oscillator for RX1 (25.60075 MHz for RX2) with the accuracy of ±2.5 ppm. Y1 output frequency is up-converted to the 2nd local frequency of 51.1015 MHz for RX1 (51.2015 MHz for RX2) by the frequency doubler U6.
At U11, the 51 MHz IF signal is mixed with the 2nd local frequency components and down-converted to the 36 kHz signal fed to MAIN board. Antenna input signal of 50 ohm/-107 dBm corresponds to the 36 kHz signal of 600 ohm/+60 dBμV.
Q10, CR4, U10 and Q11 compose the AGC circuits. The level of the input signal fed to U11 is suppressed to the fixed level by the CR5 PIN diode which is controlled by the AGC output voltage.
AGC operation is activated from the antenna input level of -50 dBm or more.

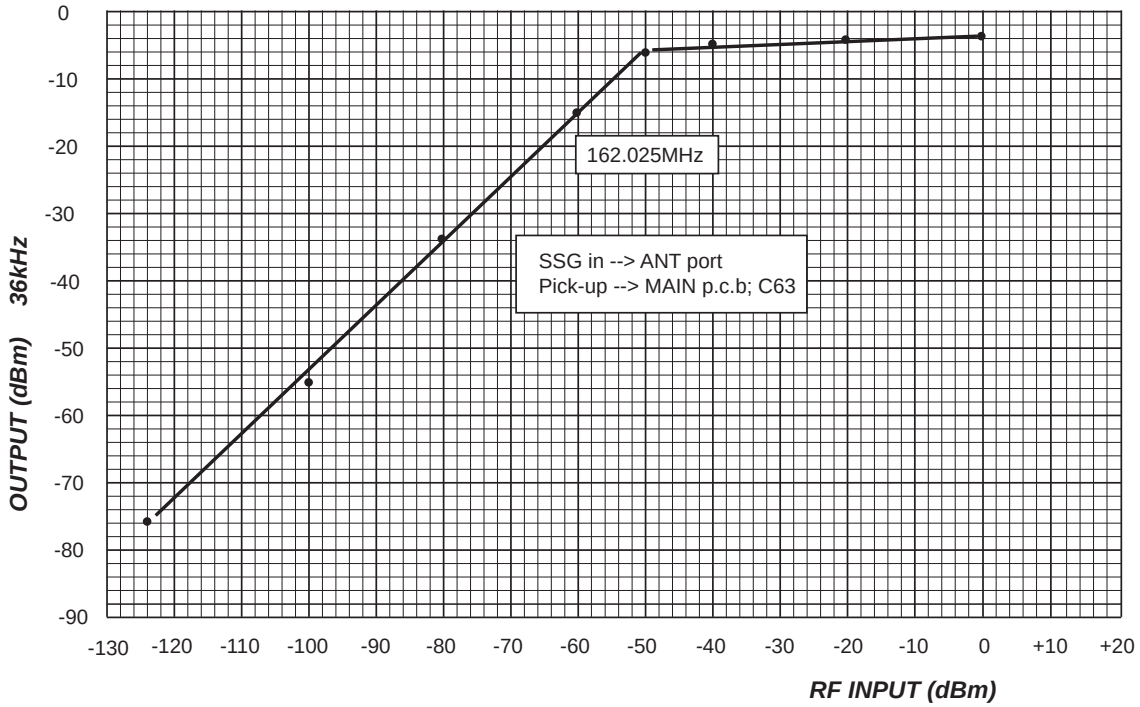


Fig. 5.2.7 Input vs Output signal level for RX1 board

Main Control and Detection signals

RX UNLOCK

The error message “CH1” or “CH2” appears during an RX abnormality when the RX PLL circuit operation becomes unlocked.
In case of the message “CH1”, RX1 Board (24P0033A) should be suspected as the cause of failure, and RX2 board (24P0033B) for “CH2”.
VCO control voltages of TP4 are +3.0 VDC to +4.5 VDC for the RX frequency of 156.026 MHz and +4.3 VDC to +5.8 VDC for 161.975 MHz.

RX MUTE

Not used.

5.2.3 DSC Board (24P0034)

CH70 DSC receiving signal of 156.525 MHz is down-converted to the 36 kHz IF signal.

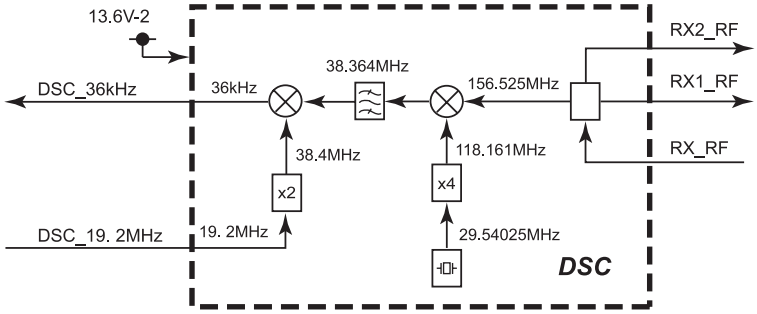


Fig. 5.2.8 Outline of DSC board

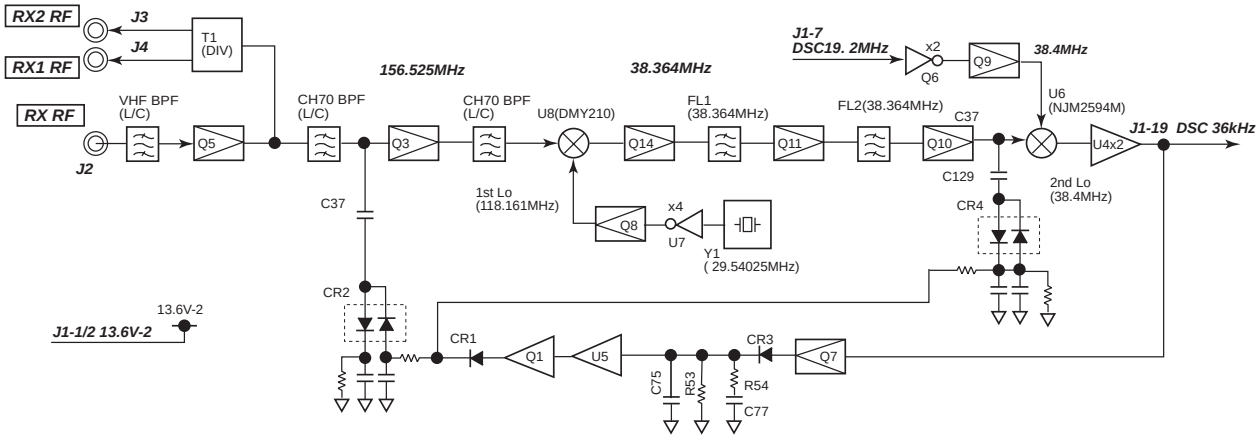


Fig. 5.2.9 Block diagram of DSC board

The receiving signal input from RX RF terminal is fed to the “VHF BPF” with the L/C circuits and Q5 and then distributed to DSC RX circuits, RX1 board and RX2 board by the divider T1. Q5 is a 6 dB amplifier for compensating the divider loss of T1. CH70 receiving signal is fed to U8 via CH70 BPF with L/C circuits and Q3.
Y1 is a 29.54025 MHz oscillator with the accuracy of ±2.5 ppm. At U7, the oscillation output frequency is multiplied by 4 into the 1st local frequency of 118.161 MHz.
At U8, CH70 DSC receiving signal is mixed with the 1st local frequency components and down-converted to the 38.364 MHz 1st IF signal.

FL1 and FL2 following U8 are the BPFs (Passband width: ±10 kHz) reducing the spurious components generated by frequency conversion.
DSC signal of 19.2 MHz from TX board is up-converted to the 2nd local oscillation frequency of 38.4 MHz by the frequency doubler Q6.
At U6, 1st IF signal of 38.364 MHz is mixed with the 2nd local frequency and down-converted to 36 kHz signal fed to MAIN board. Antenna input signal of 50 ohm/-107 dBm corresponds to the 36 kHz signal of 600 ohm/+60 dBuV.

Q7, CR3, U5 and Q1 compose the AGC circuits having 2 lines controlling for RF and IF circuits.
For RF circuits, the level of the input signal fed to Q3 is suppressed to the fixed level by the CR2 PIN diode which is controlled by the AGC output voltage. For IF circuits, the input signal to U6 is also suppressed by the CR4 PIN diode.
AGC operation is activated from the Antenna input level of -50 dBm or more.

Reference:

Input vs Output signal level for DSC board is almost same characteristic as those for RX1 board. See Fig.5.2.7.

5.2.4 MAIN Board (24P0035)

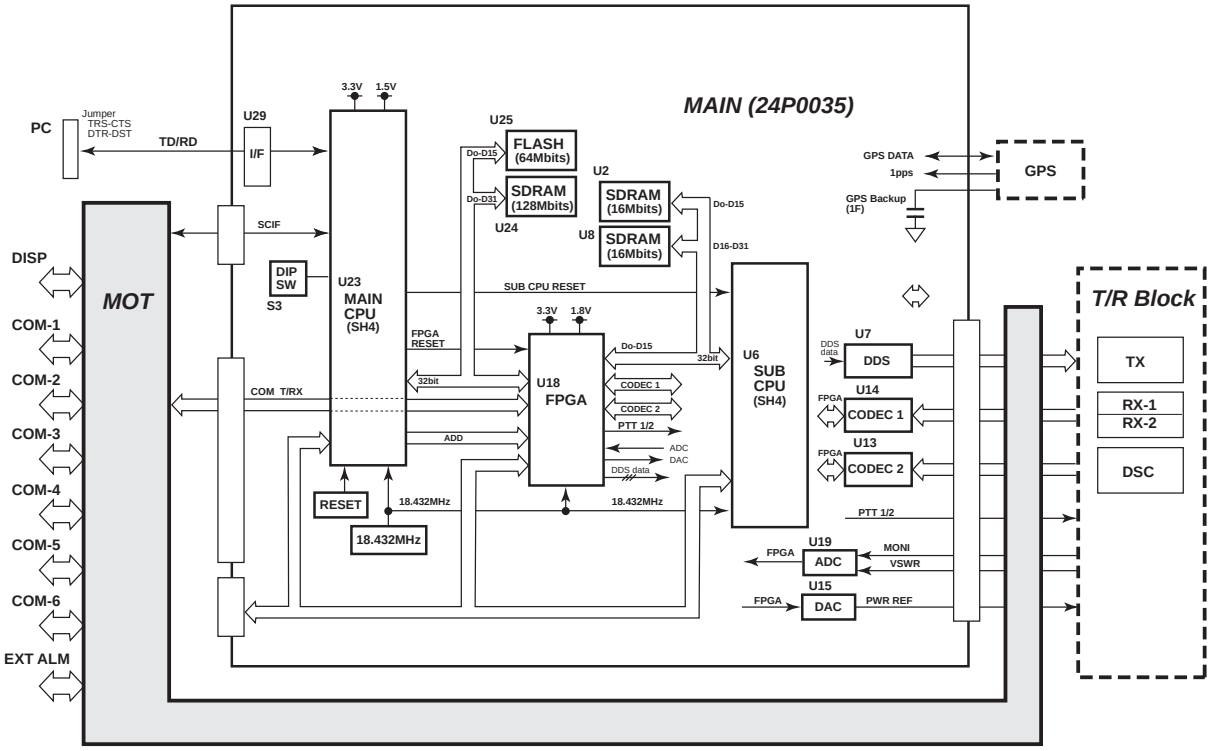


Fig. 5.2.10 Block diagram of MAIN board

The Board consists of MAIN CPU, SUB CPU, FPGA and peripheral circuits. Main functions are as follows:

MAIN CPU

For controlling and processing the AIS (DSC) communication system and I/O interfacing.

SUB CPU

For the TDMA/DSC signal processing and the analog-interfacing with the radio section.

FPGA

For the asynchronous serial communication with the external equipment, the timing control of the AIS (TDMA) communication, the TDMA slot forming and interfacing with the CODEC I/O, DDS Output, MAIN CPU and SUB CPU.

DDS

The GMSK-modulated signal of AIS (TDMA) or FM-modulated signal of DSC generated by SUB CPU is converted to 45 MHz signal by DDS and fed to TX board.

CODEC1

The 36 kHz AIS (TDMA) receiving signals are input from RX1 and RX2 boards, AD-converted, fed to SUB CPU via FPGA and then demodulated.

CODEC2

The 36 kHz DSC receiving signal is input from DSC board, AD-converted, fed to SUB CPU via FPGA and then demodulated.

Table 5.2.1 Memory allocation for FA-1501

Memory IC/ Capacity	**Type**	**Contents description**
U25: FLASH ROM 64 M (8 M x 8 / 4 M x 16) bits	MBM29DL640E90TN	- MAIN CPU Program - SUB CPU Program - FPGA Program - INITIAL SETTINGS - CHANNEL SETTINGS - PWR ON/OFF HISTORY - TX ON/OFF HISTORY - CH & PWR SETTINGS - USER SETTING -> LR MODE - SILENT MENU - NAV STATUS - MSG (CREATE MSG, TX LOG, RX LOG)
U24: SDRAM 128 M bits	EDS1232AATA_75_E	RAM for MAIN CPU (Storage area of data at the time of carrying out a program)
U2: SDRAM 16 M bits (512 k x 16 bits x 2)	IC42S16100_7T	RAM for SUB CPU (Storage area of data at the time of carrying out a program)
U8: SDRAM 16 M bits (512 k x 16 bits x 2)	IC42S16100_7T	

5.2.5 MOT Board (24P0036)

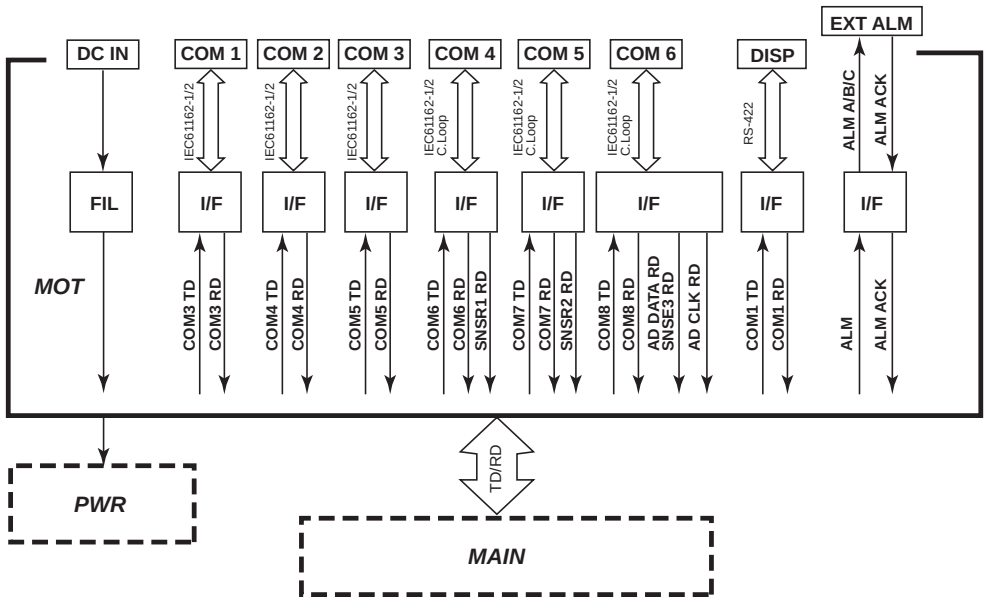


Fig. 5.2.11 Block diagram of MOT board

The specifications of this port are compatible with RS-422, and TD-A/B and RD-A/B lines have the I/O circuits electrically separated by U2:LTC1535.
In addition, the jumper between #7 and #8 of COM ports are a termination resistor of the data line. When more than one are connected to the TD-A/B line on the transmission side, the termination resistor should be mounted on the receiver side which has the electrically longest wiring.
In the case of connecting FA-150 only, use a jumper to connect #7 and #8.

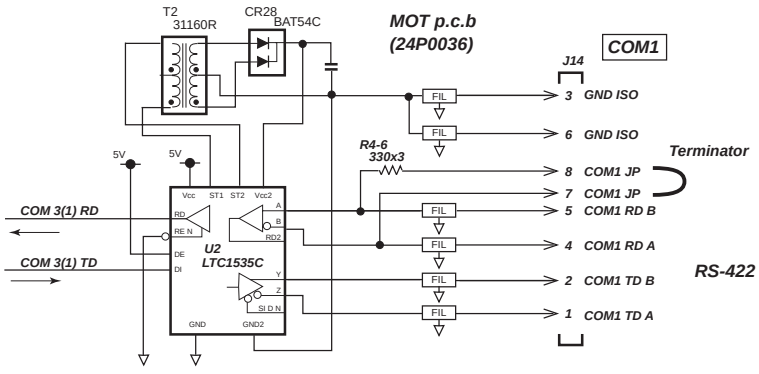


Fig. 5.2.12 I/F of COM Port

5.2.6 PWR Board (24P0037)

1. Power ON/OFF control system

The following figure shows the power ON/OFF circuit diagram.
When connecting the additional FA-1502, connect the power control line #5 and #6 of the additional FA-1502 to [DISP] port #7 and #8 of FA-1501.
System power ON/OFF control can be made by No. 1 FA-1502 or No.2 FA-1502 whichever you want.

Connect the data line (RD/TD) to COM2 or COM3 port, and set I/O port to MONITOR for MODE and to IEC 61162-2 for SPEED.

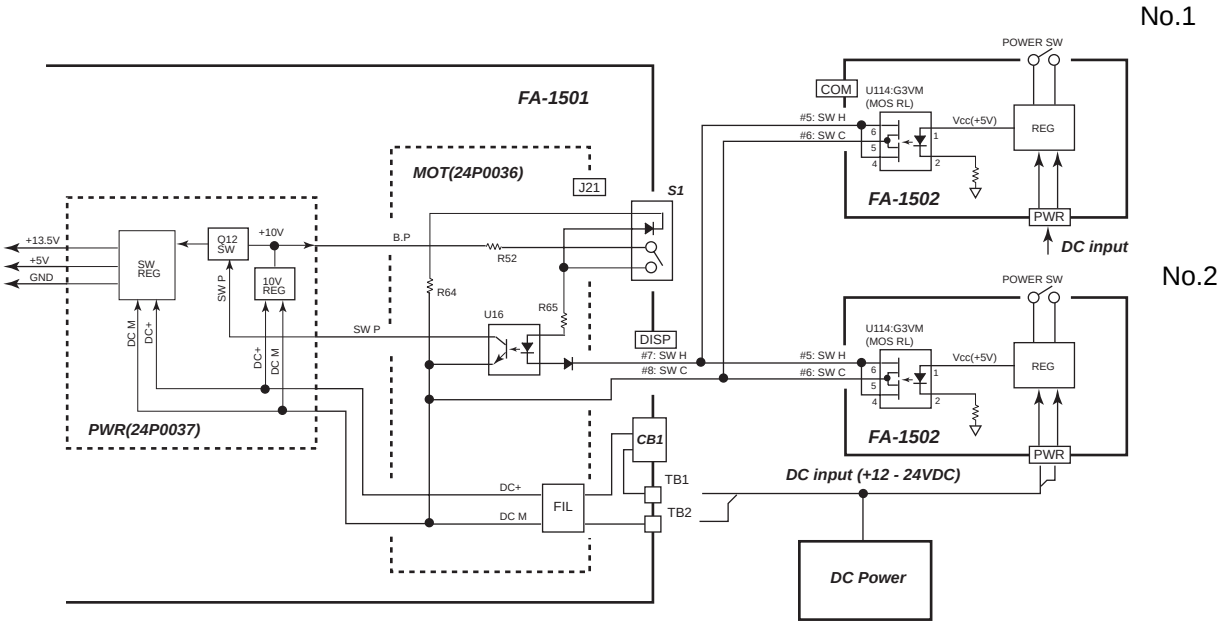


Fig. 5.2.13 Power ON/OFF Control system diagram

Power ON sequence

1. Supply the power to FA-1501 and FA-1502, and then turn on the power switch of FA-1502.
2. U114 (MOS RL) of FA-1502 will be ON.
3. U16 (Photo-coupler) of FA-1501 will be ON and Q12 on the PWR board will be controlled to be ON and then FA-1501 will get started.

Note:

In the case that Power switch of FA-1501 is not turned ON, or FA-1501 does not get started, the message “COMMUNICATION ERROR” will be displayed.

2. PWR board

Contains the switching regulator with the switching frequencies of 45 kHz ± 2 kHz. The switching frequency adjustment is made by R25 and at TP4, 3-TP2 (GND). Refer to the next page.

DC output voltages are +13.6 VDC-1, +13.6 VDC-2 and +5 VDC. Short-circuit protections is accomplished with the Poly-switches (Current-limiting resistors RT81, RT82 and RT83). Power supply reverse polarity protection is made with CR1. If the reverse polarity connection, check the Circuit-Breaker of FA-1501.

If the voltage drop down to +10 VDC or less for +13.6 VDC output, the signal of "PF: Power Fail" is output from CR52, Q51 and Q52 to MAIN board, and "PWR-OFF" event is indicated/recorded in the "POWER ON/OFF HISTORY" log screen.

Table 5.2.2 Specifications for power supply protection circuits

Protection circuit	Protection circuit operation	Note
Power supply over-voltage	Power supply input stops for the input voltage of +34 VDC to +38 VDC.	
Power supply low-voltage	Power supply input stops for the input voltage of +7 VDC to +9 VDC.	
Power supply reverse polarity connection	CR1, Circuit-Breaker	
Output over-current	Current-limiting activates for 5.3 A to 8.1 A.	For +5 VDC output.
Output short-circuit	Power supply input stops for 10 A.	For +13.6 VDC-1 output.
	Power supply input stops for 2.7 A.	For +13.6 VDC-2 output.
Output low-voltage detection	Detected at +10 VDC or less for +13.6 VDC-1, 2 outputs.	Outputs PF signal.

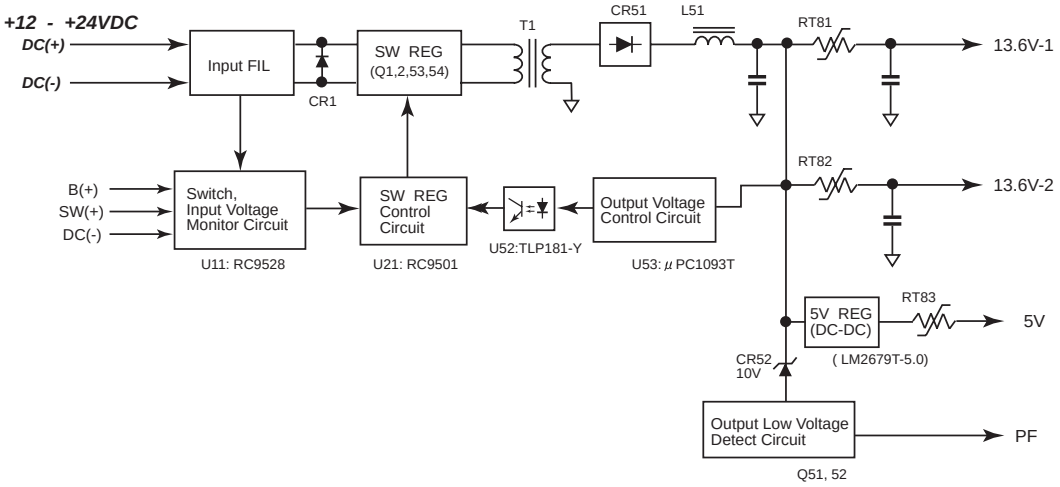


Fig. 5.2.14 Block diagram of PWR board

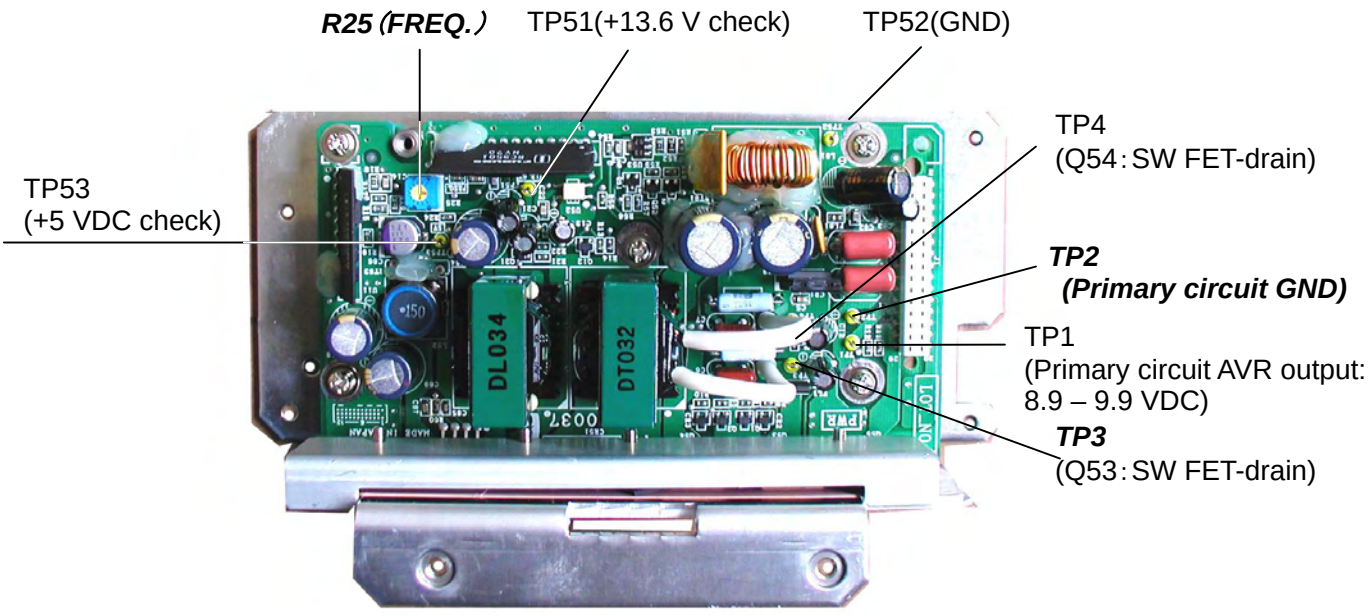


Fig. 5.2.15 PWR board

5.3 FA-1502 Block Description

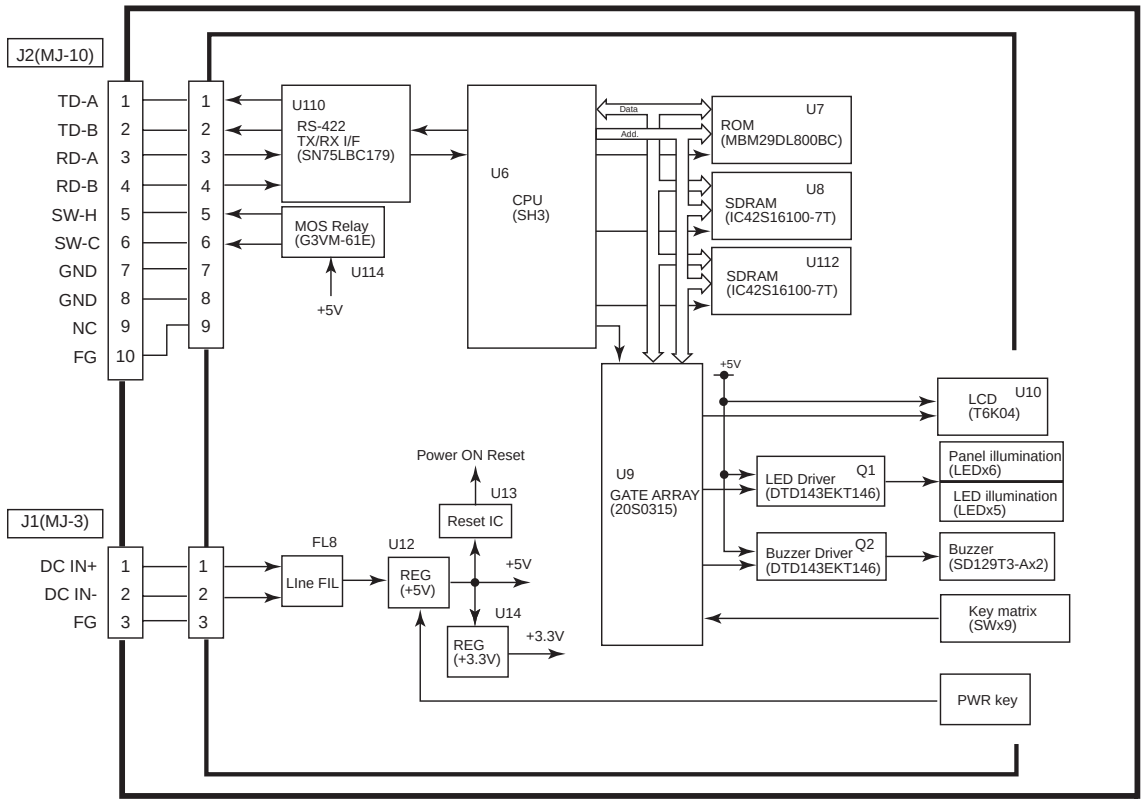


Fig. 5.3.1 Block diagram of FA-1502

FA-1501 and FA-1502 mutually communicate with each other using the RS-422 format. NMEA sentences with VDM for AIS receive data and VDO including the navigation information and own-ship's data, and P sentences for operation, setting and display, etc. are included in the communication data.

Table 5.3.1 Memory allocation for FA-1502

Memory IC/ Capacity	Type	Contents description
U7: FLASH ROM 8 M bits (1 M bits x 8/ 512 k x 16)	MBM29DL800BC	- MAIN Program - USER SETTINGS (except for LR MODE) - DIMMER/CONTRAST
U8: DRAM 16 M bits (2 x 512 k x 16)	HY57V161610ETP-7	RAM for MAIN CPU (Storage area of data at the time of carrying out a program)
U112: DRAM 16 M bits (2 x 512 k x 16)	HY57V161610ETP-7	

6.1 General

6.1.1 Program files

There are 2 programs, groups of files required to update a complete FA-150 system: One for the Transponder unit FA-1501, and the other for Monitor unit FA-1502.
Program-updating is made via the “RS-232C PC” port on the Transponder unit. In the following table, program folders and the descriptions of their files are shown. File size is just for reference.

Table 6.1.1 Program file

Program folder	File name	Size	Description
UPFA1501 FA-1501 (Transponder unit)	FA1501.BIN	994 KB	BIN file, Main CPU, SUB CPU and FPGA Programs
	LDALL.BIN	17 KB	BIN file, LOADER program for FA-1501
	UpFA1501.bat	1 KB	Batch file
	Uppg.exe	189 KB	Application file, EXE file for program loading
UPFA1502 FA-1502 (Monitor unit)	FA1502.BIN	926 KB	BIN file Program for FA-1502
	LDFA1502.BIN	3 KB	BIN file LOADER program for FA-1502
	UPFA1502.BAT	1 KB	Batch file
	UPPG.EXE	60 KB	Application file, EXE file for program loading

- FA1501 Batch file (UPFA1501.BAT)

```
uppg LDALL.BIN FA1501.BIN 0 0 200 2 1
pause
```

- FA1502 Batch file (UPFA1502.BAT)

```
uppg ldfa1502 bin fa1502 bin 0 0 50 1 1
pause
```

6.1.2 Preliminary Notes on Software Updates

1. Program-updating for both the FA-1501 and FA-1502 are made by using the [PC] port of the Transponder unit FA-1501. A DB9 to DB9 straight through cable (non-null) must be used. The electrical specifications for the [PC] port follow the RS-232C format. Data transfer rate for updating is 57.6 kbps for FA-1501, and 38.4 kbps for FA-1502. (Note that these speeds are automatically set by the UPPG.EXE file when it is initiated.) The date transfer protocols are as follows.

- Format	- Data bit: 8	- Stop bit: 1
	- Parity bit: none	
- Flow control	- None	

Note:
If you only need to update the FA-1502 LCD display's software, "TD/RD" of the "COM Port" of FA-1502 can be used instead of the [PC] port of FA-1501. The electrical specifications for the FA-1502 display's COM port follow the RS-422 format, so an RS-422 - RS-232C converter should be used when connecting it to the PC.

2. When the serial port of the PC is not assigned to [COM-1], rewrite the Batch file or change the PCs COM port setting to [COM-1]. (See procedure below)

3. "Port-setting *e.g. Speed, Data bit, Flow control, etc*" for the serial port of the PC is not necessary, because it is automatically set-up from the file of UPPG.EXE during updating.

6.1.3 Procedure for rewriting the COM Port for the batch file so that it will use some other COM port on your PC

1. Open "Device Manager" window in "Control Panel" -> "System" menus, and confirm the COM Port number that you want to use to update the FA-150. For example, if you are using a USB to RS-232C converter, it might be identified as COM3.

2. Select the appropriate batch file to be modified (display software or processor software) and open its file from the (File) - "Edit" menu. (Batch files can usually be opened in MS Windows' Text Editor.)

3. Modify the number (underlined) to reflect the appropriate COM port that you want to use on your PC.

- FA1501 Batch file (UPFA1501.BAT)

```
uppg LDALL.BIN FA1501.BIN 0 0 200 2 1
pause
```

- FA1502 Batch file (UPFA1502.BAT)

```
uppg ldfa1502.bin fa1502.bin 0 0 50 1 1
pause
```

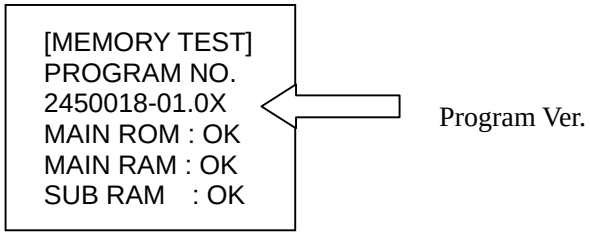
For example, to use COM3 of your PC to do the update on an FA-1501, open UPFA1501.BAT in text editor, then rewrite “uppg LDALL.BIN FA1501.BIN 0 0 200 2 **1**” to “-------- BIN 0 0 200 2 ***3***”.

4. Select “Save” in the “FILE” menu and save the edited text. If an error appears notifying you that the file cannot be saved, right-click on the batch file icon and select the “General” tag in the Property menu. Then, confirm that there is no check mark in “Read-only” box.

6.1.4 Confirming program numbers

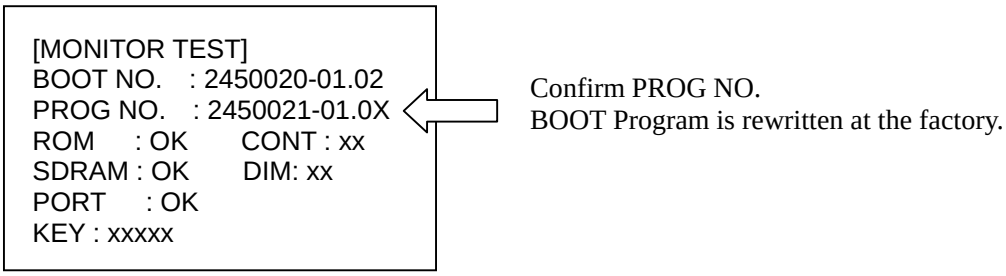
Confirming the program number for the unit FA-1501

1. Press [MENU] key. Select “DIAGNOSTICS” and press [ENT] key.
2. Select “TRANSPONDER TEST” and press [ENT] key.
3. Select “MEMORY TEST” and press [ENT] key. Confirm the program Ver. on this window.



Confirming the program number for the unit FA-1502

1. Press [MENU] key. Select “DIAGNOSTICS” and press [ENT] key.
2. Select “MEMORY TEST” and press [ENT] key. Confirm the program Ver. on this window.


[MONITOR TEST]
BOOT NO. : 2450020-01.02
PROG NO. : 2450021-01.0X
ROM : OK CONT : xx
SDRAM : OK DIM: xx
PORT : OK
KEY : xxxxx
Confirm PROG NO.
BOOT Program is rewritten at the factory.

6.1.5 Connection

The PC may be connected to the units FA-1501 and FA-1502 only with TD/RD (TX/RX) and GND lines. Control lines such as DSR, DTR are not used.

Table 6.1.1 9 pin D-Sub: Straight Cable

9 Pin D-sub	PC	FA-1501 [PC] port
1	DCD	N.C
2	RXD	PC SD
3	TXD	PC RD
4	DTR	DTR
5	GND	0V
6	DSR	DSR
7	RTS	RTS
8	CTS	CTS
9	RI	N.C
Frame	Shield	Shield

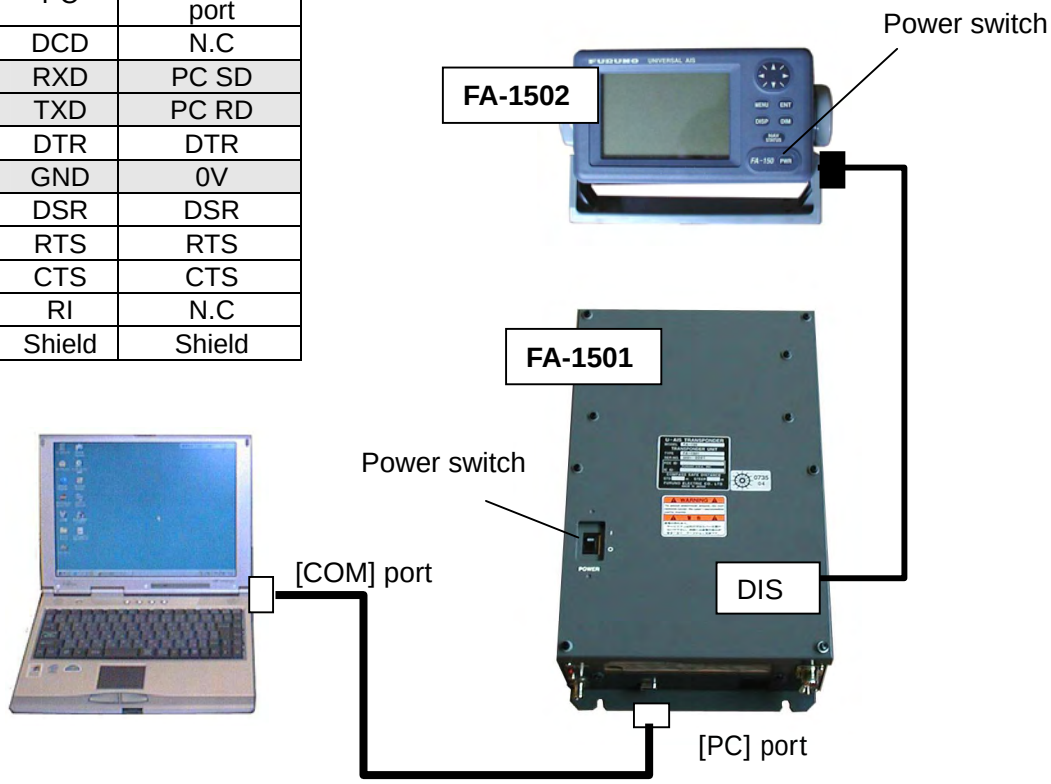


Fig. 6.1.1 Connection for updating program (for FA-1501 and FA-1502)

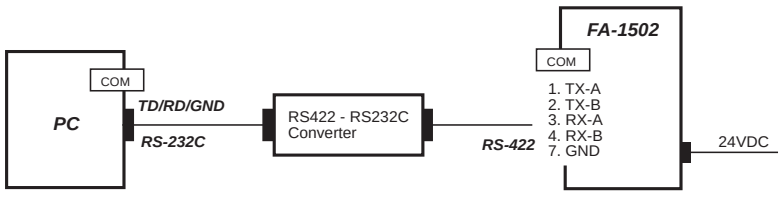


Fig. 6.1.2 Connection for updating program (for FA-1502 directly)

6.2 Updating Procedure

The update procedures for the FA-1501 and FA-1502 are identical.
Updating time:
- FA-1501; approximately 10 minutes
- FA-1502; approximately 13 minutes

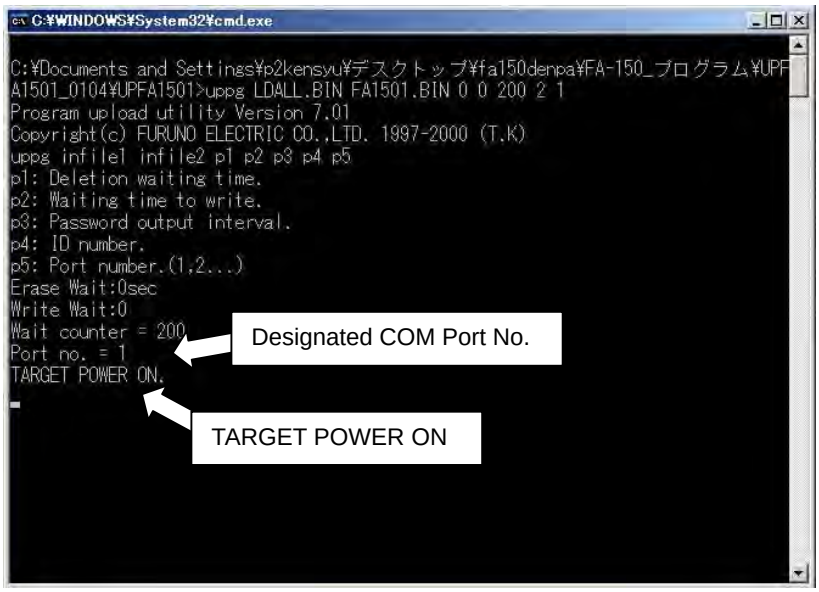
6.2.1 Procedure

1. Turn off the powers for both the FA-1501 and FA-1502.

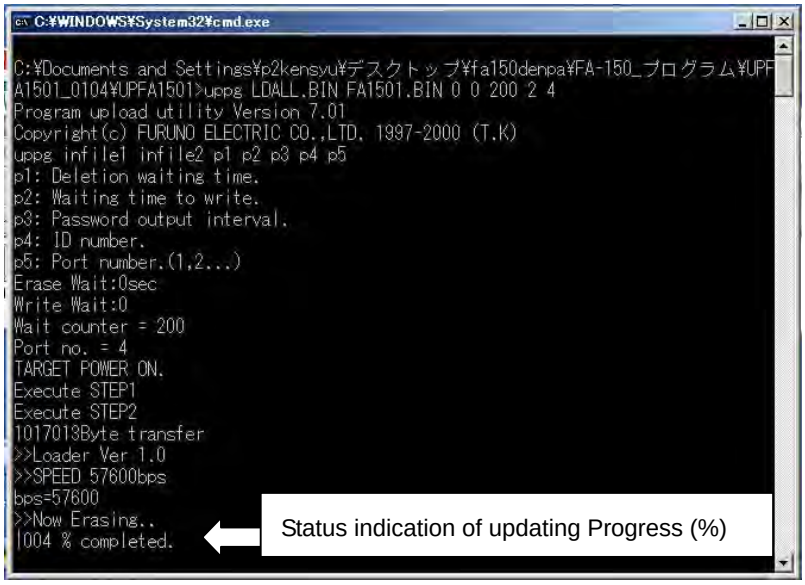
2. Open the appropriate program folder to be update.

3. Double-click the Batch file icon of the Program to be used.

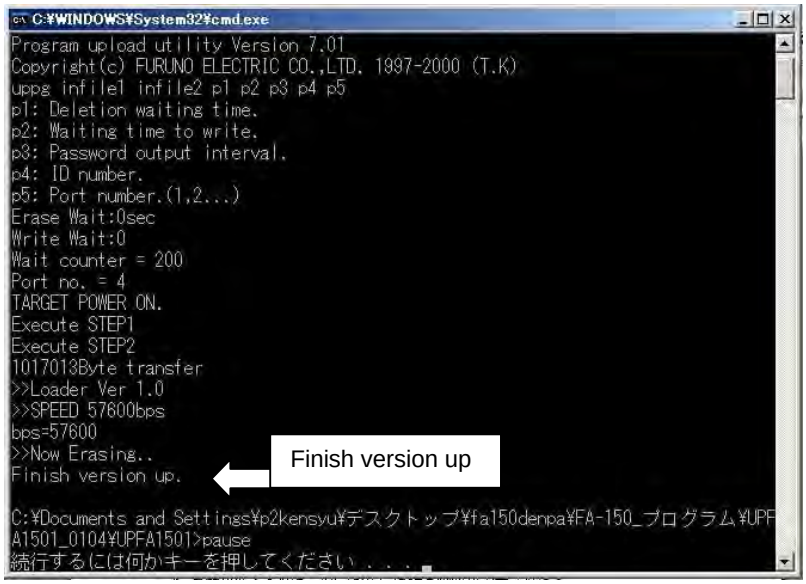
4. An DOS prompt window will appears message; TARGET POWER ON is indicated, turn on the power of FA-1501, and then, turn on the power of FA-1502.


C:¥WINDOWS¥System32¥cmd.exe
C:¥Documents and Settings¥p2kensyu¥デスクトップ¥fa150denpa¥FA-150_プログラム¥UPF
A1501_0104¥UPFA1501>uppg LDALL.BIN FA1501.BIN 0 0 200 2 1
Program upload utility Version 7.01
Copyright(c) FURUNO ELECTRIC CO.,LTD. 1997-2000 (T.K)
uppg infile1 infile2 p1 p2 p3 p4 p5
p1: Deletion waiting time.
p2: Waiting time to write.
p3: Password output interval.
p4: ID number.
p5: Port number.(1,2...)
Erase Wait:0sec
Write Wait:0
Wait counter = 200
Port no. = 1
TARGET POWER ON.
Designated COM Port No.
TARGET POWER ON

5. Program updating starts automatically.
   During the update, “INITIALIZING” message will be shown on the display. After that “COMMUNICATION ERROR” message will also be shown. This is normal.



6. When the update is completed, “Finish version up” message appears. Press the “Enter” key of PC and close DOS prompt window.



7. Turn off the powers of FA-1501 and FA-1502, and restore the system to its original operating parameters.

7.1 General

7.1.1 Measurement Flow

Note:

Note that a transmission will automatically shut off after 60 seconds. Checks must be taken within this time.

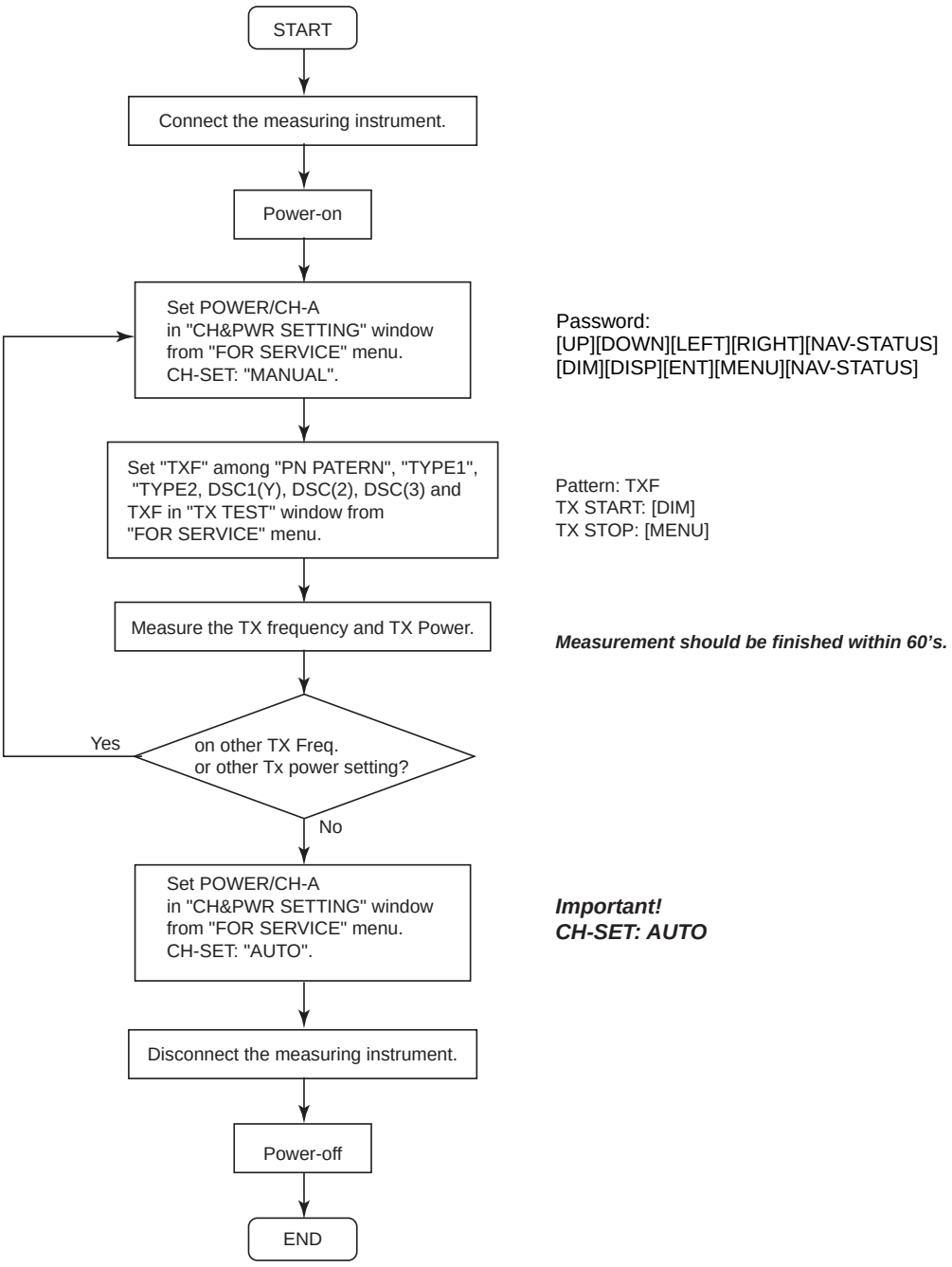


Fig. 7.1.1 Measurement Flow

7.1.2 Connection of Measuring Instrument

1. Connect a 50 ohm coaxial cable between power meter and [VHF] connector of the FA-1501, and connect other side of power meter to a 50 ohm dummy load.

2. Set a pick-up coil with five to ten turns to the VHF ANT cable for measuring TX frequency.

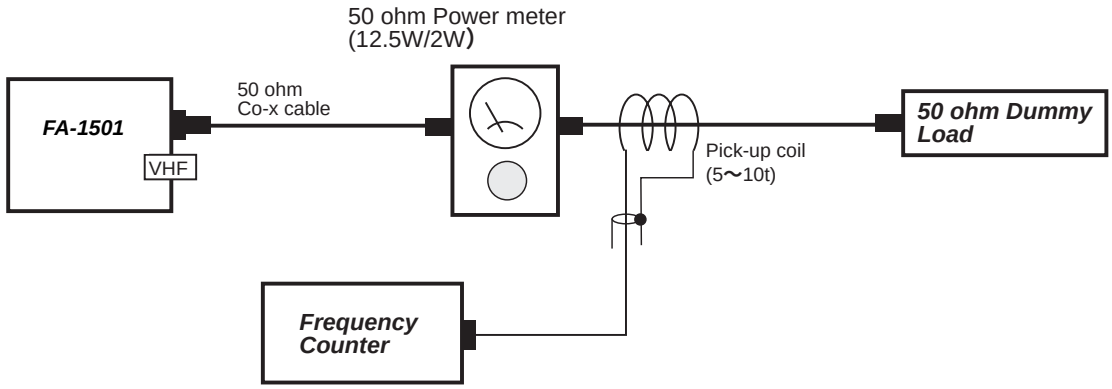


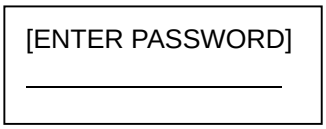
Fig. 7.1.2 Connection

7.2 Measurement and Adjustment

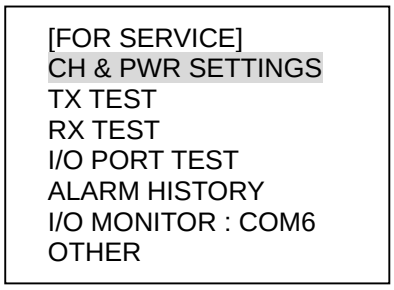
7.2.1 Measurement of TX Output power and TX frequency

Setting FREQ./POWER/CH SET

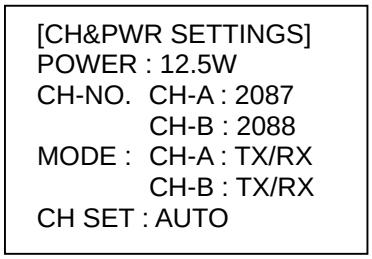
1. Press [MENU] key. Select “FOR SERVICE” in DIAGNOSTICS menu and press [ENT] key. The following password entry window appears.



2. Enter the password.
   Press [↑][↓][←][→][NAV STATUS][DIM][DISP][ENT][MENU][NAV STATUS] keys in sequence. The “FOR SERVICE” window appears.



3. Select “CH & PWR SETTINGS” and press [ENT] key.
   The “CH & PWR SETTINGS” window appears.



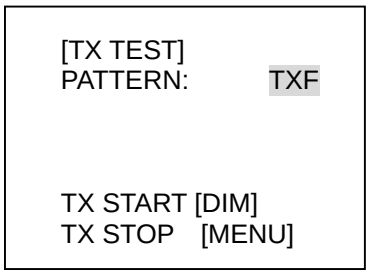
4. Set “POWER” and “CH-A” channels as follows. Then set “CH SET” to “MANUAL” and press [MENU] key to return “FOR SERVICE” window.

Note:

- POWER ; Select TX output power for 0 W, 1 W 2 W or 12.5 W
- CH-NO. ; Valid only for CH-A data (invalid for CH-B)
- MODE ; Not related to the measurement for setting to “TX/RX” or ”UNUSED” Set both CH-A and CH-B to “TX/RX”.
- CH SET ; Set to “MANUAL” for measurement.
  When setting to “MANUAL”, channels and modes set in this window for the regional operating area are used for operation.
  Press [MENU] -> CHANNEL SETTINGS -> VIEW CHANNEL, and then you can confirm the channel information in operation.
  After measuring, you should return to “AUTO”.

Setting to TX TEST Mode

5. Select TX TEST in “FOR SERVICE” window, and press [ENT] key.
   The “TX TEST” window appears.



6. Select “PATTERN” and press [ENT] key. Selection window of the modulating signals appears. And select “TXF” and press [ENT] key.

Item	Signal to be transmitted
PN PATTERN	AIS signal modulated by random signal
TYPE 1	AIS signal modulated by 10101 signal
TYPE 2	AIS signal modulated by 0110011 signal
DSC 1 (Y)	DSC signal modulated by Y signal
DSC 2 (B)	DSC signal modulated by B signal
DSC 3 (BY)	DSC signal modulated by B-Y signal
TXF	Non-modulated signal

Measuring

7. Press [DIM] key to start the transmission.
   "NOW TRANSMITTING STOP : MENU" indication is popped-up.
   Press [MENU] key to stop the transmission.
   "FINISHED TRANSMITTING PRESS ANY KEY" indication is popped-up.
   Press [ENT] key to return to "TX TEST".

   Within 60 seconds, complete TX the frequency and TX output power measurement.
   - Allowable power tolerance : within ± 20 % (for 1 W, 2 W and 12.5 W)
   - Allowable frequency tolerance : within ± 3 ppm

8. After completion, press [MENU] key to return to "FOR SERVICE" window.
   When confirming the other channel and output power, return to the step 3.

9. Select "CH & PWR SETTINGS" and press [ENT] key.

10. Put "POWER" and "CH-A" channels back to the previous settings and then "CH SET" to "AUTO". Press [MENU] key to go out of "FOR SERVICE" window.

11. Turn off the power and disconnect the measuring equipment, and then set to FA-150 back to its original operating condition.

7.2.2 Adjusting TX output power

Note:
When TX Power output with the antenna connected does not meet specifications, confirm the TX Power with 50 ohm dummy loaded instead of the antenna to check that the antenna condition is normal.
To adjust the power, turn "R133" on TX board until 12.5 W is obtained. There is no way to adjust the 1 W and 2 W settings.

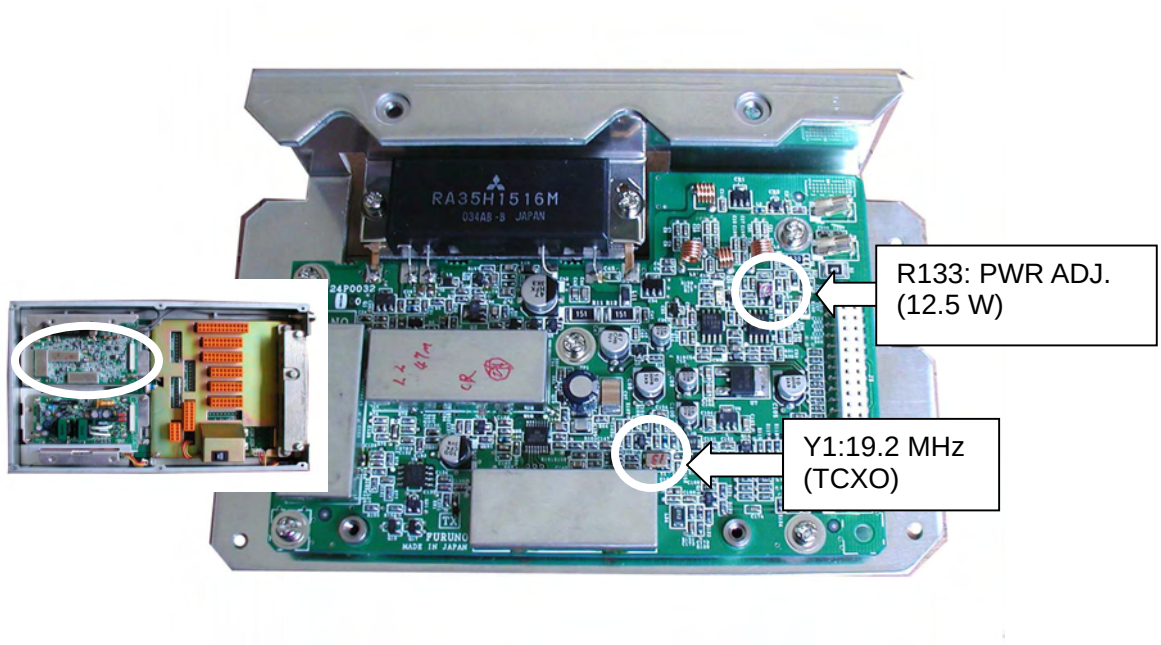


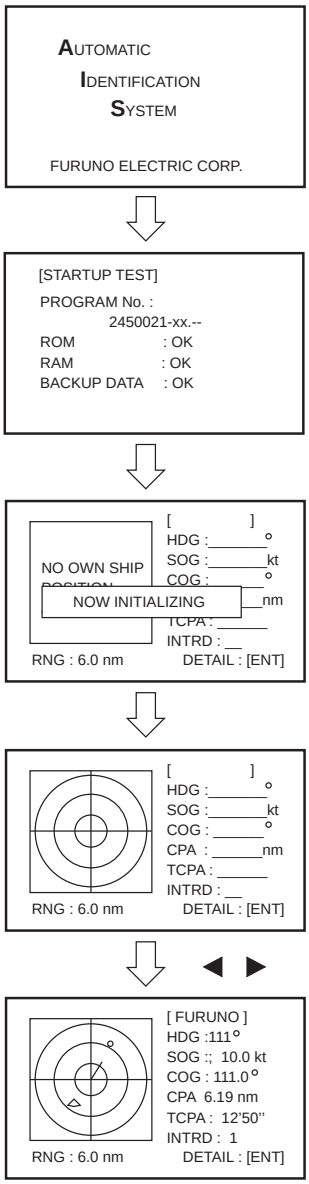
Fig. 7.2.1 TX board

7.2.3 Adjusting TX output frequency

Frequency adjustment is not necessary due to the use of TCXO. If the tolerance of the TX frequency is found to exceed ± 3 ppm, replace the TX board.
TCXO is allocated as Y1 (19.2 MHz) on TX board. Refer to Fig. 7.2.1.

Introduction

First, turn ON the power switch of FA-1501 processor. Then, press the PWR key of FA-1502 to turn the equipment on or off. When powered, the equipment emits a beep and then proceeds in the sequence shown below.



FA-1502 self-test begins.
- Program: FA-1502 program No.
- ROM: FA-1502 Flash ROM check
- RAM: FA-1502 RAM check
- BACKUP DATA: Flash ROM backup data is checked for the proper state.

NOW INITIALIZING:
Shows that communications with FA-1501 processor is being established.
COMMUNICATION ERROR:
Indicates that communications failed to be established between FA-1501 and FA-1502.
NO OWN SHIP POSITION AVAILABLE:
Will be shown until the own ship position data is detected.

Indication when the own ship position data is detected. "ENTER MMSI!" is displayed in the event that no MMSI is registered.

Pressing [<], [>] keys display the target data.
- Pressing the [>] key displays the target data nearest to own ship.
- Pressing the [<] key displays the target data of the vessel that is farthest from own ship.

1. The position message should be given within 2 minutes after the power is turned on. The static data and navigational data are reported every 6 minutes and the reporting interval of dynamic data varies in accord with the ship speed.
2. Unless MMSI is registered, report (transmission) does not begin. In addition, VDM sentence is outputted but VDO sentence is not outputted.
3. Unless the ship's position data is available, position without any position data is reported and VDO and VDM sentences are output.

8.1 ALARM STATUS

8.1.1 Alarm status: DISP -> ALARM STATUS

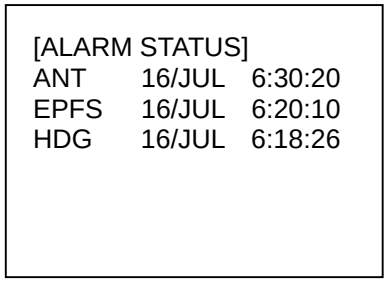
When alarms such as loss of position data, etc. are detected, their status is shown by related popup displays and an alarm sound is output.
When the alarm state is removed, pressing any key of FA-1502, or turning ON ALM ACK signal acknowledges the alarm. Then, the popup display disappears, alarm sound output stops and the EXT ALM goes to the OFF state.

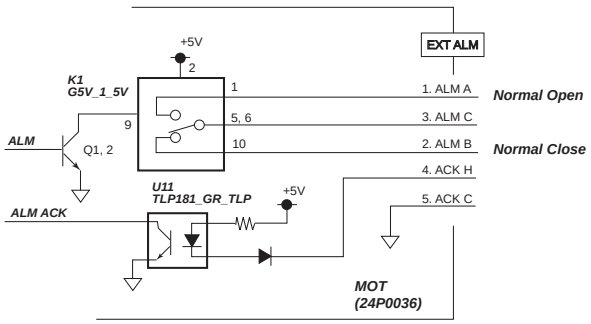
Related settings:

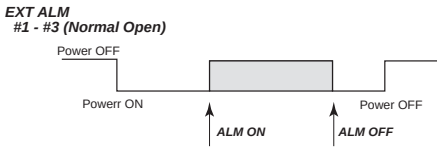
1. ON/OFF of ALARM BUZZER
   The Alarm audio can be turned ON/OFF by the setting of [MENU] -> USER SETTINGS -> ALARM BUZZER. However, EXT ALM is still output regardless of its setting. See page 3-27.

2. EXT ALM output can be configured to be output by the setting of [MENU] -> FOR SERVICE -> OTHER -> ALM MODE (CONTNUOUS and KEY STOP).
   See page 3-22.

Pressing the [DISP] key several times to open the [ALARM STATUS] screen displays a list of active alarms and their respective date and time (latest 25 cases). When the alarm state is removed, the applicable alarm is automatically erased from the list.
In addition, these alarm messages are output in data format by utilizing the ALR sentence. The ALR sentence is outputted every 25 seconds. If there is no alarm, the ALR sentence content “Alarm is set to General Failure and alarm state is set to normal range (V)” is outputted on every 2 minutes.
In addition to the [EXT ALM] output terminal, relay contact signals are also provided. The maximum rating is 30 VDC/2 A, 125 VAC/0.5 A.







ALM OFF:
- When the alarm state is removed
- When any key of FA-1502 is pressed
- When ALM ACK signal turn ON

Fig. 8.1.1 EXT ALM output circuit

Handling of Time:

The information on date and time used in the following items is based on the clock of MAIN CPU. The clock is calibrated in order of ZDA sentence from internal "GPS" > "MSG-11, MSG-4" > "position fixing time of RMC sentence input from external GPS". Calibration is carried out every time the time data is inputted.

- [MENU] -> DIAGNSTICS -> PWR ON/OFF HISTORY
- [MENU] -> DIAGNSTICS -> TX POWER HISTORY
- [MENU] -> DIAGNSTICS -> FOR SERVICE -> ALARM HISTORY
- [DISP] -> ALARM STATUS

Table 8.1.1 List of Alarms

ALM status indication	Description	
TX	Tx malfunction	Transmission failure. Transmission will stops.
ANT	Antenna VSWR is above limit	Antenna VSWR trouble. AIS continues operation.
CH1	Rx channel 1 malfunction	Rx1 board (24P0033A) failure. Transmission stop of corresponding transmission channel
CH2	Rx channel 2 malfunction	Rx2 board (24P0033B) failure. Transmission stop of corresponding transmission channel
CH70	Rx channel 70 malfunction	DSC Rx board (24P0034) failure. AIS continues operation.
MKD	MKD connection lost (Minimum Keyboard and Display)	MKD connection is lost, AIS continues operation. (In actuality, this alarm can not be shown.)
EPFS	External EPFS lost (EPFS: Electronic position fixing system)	External navigator data is lost. AIS continues operation.
L/L	No sensor position in use	There is no position data to be used.
SOG	No valid SOG information (SOG: Speed Over Ground)	SOG information from internal ad external GPS is invalid data.
COG	No valid COG information (COG: Course Over Ground)	COG information from internal ad external GPS is invalid data.
HDG	Heading lost/invalid	HDG information data is lost/invalid.
ROT	No valid ROT information (ROT: Rate of Turn)	When HDG data and $TI-ROT data are unavailable.
FAIL		System failure in general

8.1.2 Alarm status analysis

1. TX (Tx malfunction)

   This message is displayed when PLL circuit of TX board is UN-LOCK, when transmission output drops or when transmission signal is detected though MAIN CPU does not control transmission. The detection signal is "MONI" signal of TX board.

   When this message is given, no transmission is allowed if the PLL circuit is UN-LOCK. Check the TX board if this alarm is shown.

2. ANT (Antenna VSWR exceeds limit)

   This message is displayed when VSWR monitoring circuit detects VSWR 3 or more. Transmission operation will continue. Detection signal is "R-VSWR" of TX board. Check for antenna breakage, defective antenna cable, leakage from coaxial cable, bad contact of antenna cable connector or other antenna line trouble.

3. CH1 (Rx channel 1 malfunction)

   "PLL UNLOCK" signal of PLL circuit of RX1 board is monitored. When this signal is detected, transmission of corresponding channel: CH-A is stopped. Check RX1 board if this alarm is shown.

4. CH2 (Rx channel 2 malfunction)

   "PLL UNLOCK" signal of PLL circuit of RX2 board is monitored. When this signal is detected, transmission of corresponding channel: CH-B is stopped. Check RX2 board if this alarm is shown.

5. CH70 (Rx channel 70 malfunction)

   This message is displayed when DSC message (Format specifier) is unable to correctly decode a DSC message, even if DSC format signal or carrier signal is received continuously for 90 seconds or more. Trouble of DSC RX board is suspect.

   Note:

   For example, when DOT pattern signal transmitted by FM-8500 is received for 90 seconds or more, this alarm is shown. This alarm continues until the next DSC message is correctly received.

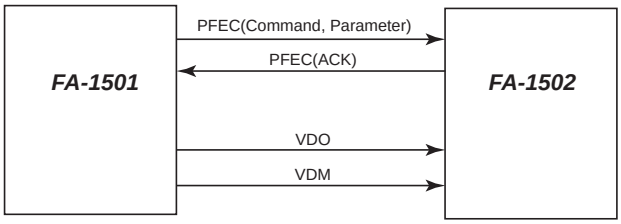
6. MKD (MKD connection lost)

   This alarm indicates that a communication failure from FA-1502 to the FA-1501 has been detected. This check is carried out by PFEC data sentences, and confirms connection every 15 seconds to ensure that the FA-1502 display is connected. If the PFEC data response from the FA-1502 is not received, MKD alarm occurs. Note that when a second FA-1502 is connected, no MKD error is indicated if communication with the second FA-1502 takes place properly.

Reference:

When COMMUNICATION ERROR is displayed;

This alarm occurs when the VDO sentence sent from the FA-1501 (every second) is not received at the FA-1502.



VDO: Dynamic data and static data which FA-150 transmits are sent to external listeners by this sentence.

VDM: Information about other ships received are sent to external listeners by this sentence.

PFEC: Control commands and setting parameters are transferred by this sentence.

7. EPFS (External EPFS lost)

This message is displayed when no position data is received from external GNSS for 5 seconds or more, or when the data being received is invalid. The input sentences which contain the position data are GNS, GLL, GGA and RMC.

8. L/L (No sensor position in use)

This message is displayed when no position data is present from either external GNSS or internal GPS, or both are found to be invalid. The input sentences concerning the position data are GNS, GLL, GGA and RMC.

9. SOG (No valid SOG information)[Note-1]

This message is displayed when SOG data is not received or is invalid. The sentences concerning SOG sentences are VBW, RMC, VTG and OSD.

10. COG (No valid COG information)[Note-1]

This message is displayed when COG data is not received or is invalid. The sentences concerning COG sentences are VBW, RMC, VTG and OSD.

11. HDG (Heading lost/invalid)[Note-2]

This message is displayed when there is no heading data or the data is found to be invalid. The sentences concerning heading are HDT, OSD and AD format.

12. ROT (No valid ROT information)

This message is displayed when there is no HDG data or $TI ROT data.
The data related to ROT display are:

1) Value of $TI ROT
2) Calculated value from heading sentences of HDT, OSD or AD format
   - When ship is turned more than 10 degrees on the right (+5 deg/30 sec or more); R>10.0
   - When ship is turned more than 10 degrees on the left (+5 deg/30 sec or more); L>10.0
   - When ship is turned less than 10 degrees (within +5 deg/30 sec); 0.0

Note-1:

SOG and COG are taken from the same sentence. In addition, VBW (use of speed over the ground) is not used unless heading (HDT, OSD) data is received. VBW is handled as described in the table below.

Table 8.1.2 SOG/COG display processing

Input sentence					COG display	SOG display
VBW	**HDT**	**OSD**	**RMC**	**VTG**		
Yes	Yes	No	No	No	Calculated value of VBW and HDT is displayed.	VBW is displayed.
Yes	No	Yes	No	No	Calculated value of VBW and HDT is displayed.	VBW is displayed.
Yes	No	No	Yes	Yes	Displayed by priorities of RMC>VTG.	Displayed by priorities of RMC>VTG.
Yes	No	No	No	No	Not displayed	Not displayed

Note-2:

If the HDT talker is $HC, it is invalid. Choose talkers other than $HC, $HE or $HN. When the AD format is used, set the AD-100 transmission interval to within 1 second.

8.2 SENSOR STATUS

8.2.1 Confirm sensor input currently in use

Press the [DISP] key until OWN DYNAMIC DATA display is shown. Position data, SOG, COG, etc. The sensor status screen, which may be accessed by pressing [MENU] -> SENSOR STATUS, will confirm whether external or internal sensors are actively being used.

Table 8.2.1 List of SENSOR STATUS

Display	Use state
UTC CLOCK LOST	Internal GPS positioning failure
EXTRL DGNSS	External DGNSS
EXTRL GNSS	External GNSS
INTRL DGNSS BEACON	Internal DGPS used (BEACON connected)
INTRL DGNSS MSG 17	Internal GNSS is differential-compensated by MSG17.
INTRL GNSS	Internal GNSS
EXTRL SOG/COG	SOG/COG from external GNSS
INTRL SOG/COG	SOG/COG from internal GPS
HDT VALID	HDT valid
ROT VALID	ROT valid
OTHER ROT	In the event that value calculated from HDT or talker is ROT other than $TI ROT.
CH MANAGEMENT	Displayed when channel is changed in sea area operation (displayed for about 30 seconds).

8.2.2 Handling of sensors

1. Sentences required by AIS

Table 8.2.2 Sentences required by AIS

	FA-150 processing	IEC-61162	
	Priority order of sentence	Required	Optional
Datum Ref.	DTM	DTM	
POS	**GNS**> **GLL**> GGA>RMC	GNS, GLL	GGA, RMC
SOG	VBW ＞RMC ＞VTG＞OSD	VBW	VTG, OSD, RMC
COG	RMC＞VTG＞OSD	RMC	VTG, OSD
HDG	HDT＞OSD＞AD FORMAT	HDT	OSD
ROT	$TI ROT>HDG (Calculated value from HDG)	ROT	
RAIM		GBS	

2. Input/Output sentences for each MODE setting

Input/Output sentences control vary in accord with the MODE settings of COM1 to COM6. See page 3-7 for the detail.

** [MENU] -> INITIAL SETTINGS -> SET I/O PORT -> MODE **

3. Processing of sentences

AIS requires IEC-61162 Ed 2. (NMEA Ver-2.0 or higher) Processing key points are described as follows. To use NMEA Ver.-1.5, see page 8-29.

1) Conditions which will result in an invalid sentence include the following:
   - When checksum is abnormal.
   - When NULL code is included in position data.
   - When N/S of position data exceeds 90 degrees or W/E exceeds 180 degrees.
   - When azimuth bearing data is other than 0 to 359 degrees.
   - When ship speed data is other than 0.0 to 99.99 knots.
   - When reception error occurs in sentence.

2) Priority processing of sentence

Table 8.2.3 Priority processing of sentence

Pos.	GNS > GLL (with Mode IND) > GGA > RMC (with Mode IND) > GLL (with no Mode IND) > RMC (with no Mode IND) ***Note: GLL, RMC*** *NMEA Ver.-1.5: with no Mode IND / NMEA Ver.-2.0 or higher: with Mode IND*
SOG, COG	VBW > RMC > VTG > OSD
HDG	HDT > OSD
RAIM	GBS
ROT	ROT

3) Each sentence input interval is times out after 5 seconds. Set the output sentence interval from external GNSS to less than 5 seconds.

4) External sentences are not allowed unless they contain checksum data. In addition, the data is not allowed if the checksum is erroneous.

5) If any sentence includes both valid and invalid, the entire sentence will be ignored / not allowed.

6) Processing of Mode Indicator

RMC, GLL, etc., contain a Mode Indicator, and AIS is operated in accordance with information such as Autonomous, Differential, Dead reckoning, Data not valid, etc. For example, in the case of Autonomous (Normal) mode and Position accuracy information contained in Msg. 1 to Msg.3 is “Low” and differential, “High” information is sent.

In the case of mode other than autonomous and differential mode, the data is not used. In FA-150, if any sentence with no Mode Indicator is received, it is processed as the Autonomous mode (Normal).

When a sentence with Mode Indicator attached is received, if the mode is other than Autonomous or Differential, the data is not used and FA-150 processes as error.

7) Sensor input change over time
Change over from higher priority to lower priority of (D)GNSS sensor input takes place in 5 seconds. Change over from lower priority to higher priority takes place in 30 seconds.
The priority order is:
External DGNSS > internal DGPS MSG.17 > internal DGPS BEACON > external GNSS > internal GPS
There is no priority order for talker name. HDT and ROT are displayed when the sentences are received.

8) Processing of DTM sentence
In the AIS system, reference datum: WGS-84 is used for DTM sentence. Output DTM: WGS-84 for setting of GNSS output sentence.
If DTM sentence is not received, the position data is processed as WGS84 and transmitted.

Table 8.2.4 Handling of DTM sentence

Local Datum	***Reference Datum***	**Transmission of position data**	**Display of position data**
WGS84	Anything is acceptable.	Transmitted	Displayed
Anything is acceptable.	*WGS84*	Offset is calculated and transmitted.	Offset is calculated and transmitted.
Other than the above		181°/91° is transmitted as invalid data.	Invalid: --

9) Processing of SOG and COG

SOG and COG are taken from the same sentence. VBW (use of speed over the ground) is not used unless heading (HDT, OSD) data are received. VBW is handled as described in the table below.

Table 8.2.5 Processing of SOG/COG

Input sentence					COG display	SOG is displayed.
VBW	HDT	OSD	RMC	VTG		
Yes	Yes	No	No	No	Calculation values of VBW and HDT are displayed.	VBW is displayed.
Yes	No	Yes	No	No	Calculation values of VBW and HDT are displayed.	VBW is displayed.
Yes	No	No	Yes	Yes	Displayed in priority order of RMC>VTG.	Displayed in order of RMC>VTG.
Yes	No	No	No	No	Not displayed.	Not displayed.

10) Processing of ROT sentence

The AIS automatically selects the ROT source with the highest priority available: $TI ROT (Rate of Turn Indicator) > Other ROT source.

Other ROT source data is based on HDT, OSD or AD format information. When other data source is in use, the contents of the ROT field in the AIS data is given in the table below.

Table 8.2.6 Processing of ROT

Change of ROT	Display of ROT data	Data of transmitted message
Change greater than ±5 deg/30 sec.	R(L) > 10.0 deg/min	±127 deg/min
Change within ±5 deg/30 sec.	0.0 deg/min	0.0 deg/min

Table 8.2.7 Table showing sentence status if checksum is received or not received (NMEA Ver. 1.5, 2.0)

Sentence			Check-sum	Valid/ Invalid	Note
NMEA Ver-1.5	***DTM***	Reference			Sentence is not defined.
	GNS	Position			Sentence is not defined.
	GLL		No	No	
	GGA		No	Yes	
	RMC		Yes	Yes	
	VBW	SOG			Sentence is not defined.
	VTG		No	No	
	OSD				Sentence is not defined.
	RMC		Yes	Yes	
	RMC	COG	Yes	Yes	
	VTG		No	No	
	OSD				Sentence is not defined.
	HDT	Heading	No	No	
	OSD				Sentence is not defined.
	ROT	Rate of tune			Sentence is not defined.
NMEA Ver-2.0	***DTM***	Reference	Yes	No	
	GNS	Position			Sentence is not defined.
	GLL		Yes	Yes	
	GGA		Yes	Yes	
	RMC		Yes	Yes	Checksum is mandatory.
	VBW	SOG	Yes	Yes	
	VTG		Yes	Yes	
	OSD		Yes	No	
	RMC		Yes	Yes	Checksum is mandatory.
	RMC	COG	Yes	Yes	Checksum is mandatory.
	VTG		Yes	Yes	
	OSD		Yes	No	
	HDT	Heading	Yes	No	
	OSD		Yes	Yes	Valid/Invalid data is present in Heading status.
	ROT	Rate of tune	Yes	Yes	

Table 8.2.8 Table showing sentence status if checksum is received or not received (NMEA Ver. 3.0)

Sentence			Check-sum	Valid/ Invalid	Note
IEC61162-Ed2) || NMEA Ver-3.0	***DTM***	Reference	Yes	No	
	GNS	Position	Yes	Yes	
	GLL		Yes	Yes	
	GGA		Yes	Yes	
	RMC		Yes	Yes	
	VBW	SOG	Yes	Yes	
	VTG		Yes	Yes	
	OSD		Yes	No	
	RMC		Yes	Yes	
	RMC	COG	Yes	Yes	
	VTG		Yes	Yes	
	OSD		Yes	Yes	
	HDT	Heading	Yes	No	
	OSD		Yes	Yes[Note)]	Valid/Invalid data is present in Heading status.
	ROT	Rate of tune	Yes	Yes	

Note:

- Italic characters in the Sentence column are sentences required for AIS. Others are optional.

- With NMEA version 2.0, the check-sum of RMC sentence is mandatory.
  The check-sum of the other sentences is not mandatory.
  Note that some models (GP-30 series) are not provided with the check-sum.

8.3 INTERNAL GPS

The data derived from the built-in GPS (GN-8093) can be confirmed.
This GPS is DGPS capable, and is compatible with the RTCM-SC-104 DGPS correction protocol.

- Received signal: L1 (1575.42 MHz, C/A Code)
- Maximum number of tracking satellites is GPS 12ch + WAAS 2ch.
- Position update time: 1 second
- External serial communication: Asynchronous serial communication (4800 bps)
- Output data format: NMEA Ver. 2.30-compliant
  Data related to position are transmitted in GPGSA, GPGBS, GPZDA, and GPRMC sentences.
- Time to first fix: Hot start; 9 seconds (typ), Warm start; 36 seconds (typ)
  Cold start; 43 seconds (typ)

Reference:

The built-in GPS test can be carried out by [MENU] -> DIAGNOSTICS -> TRANSPONDER TEST -> GPS TEST.

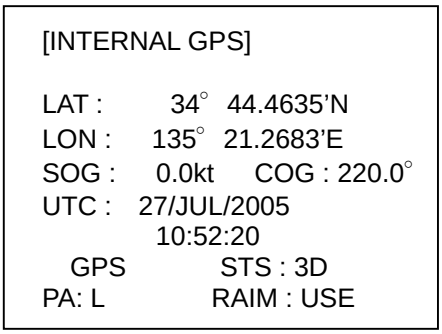
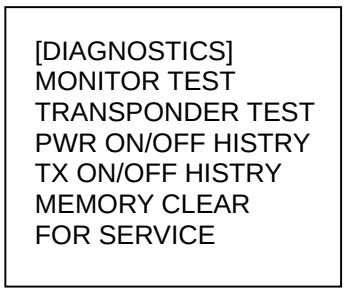


Table 8.3.1 Display content of INTERNAL GPS

Item	Description
Pos., SOG/COG, Date	Pos., SOG/COG:GPRMC data is displayed. Date: GPZDA data is displayed.
STS (Status)	- 2D: two-dimensional positioning, 3D: three-dimensional positioning - D2D: two-dimensional positioning by differential GPS - D3D: three-dimensional positioning by differential GPS - NO FIX: not positioning - DOP: when HDOP value exceeds 4 at 2D and 6 at 3D
PA (Position Accuracy)	Differential GPS - H: Positioning accuracy is within 15 m. - L: Positioning accuracy is 15 m or higher. Normal GPS - H: Positioning accuracy is within 5 m. - L: Positioning accuracy is 5 m or higher.
RAIM (Receiver Autonomous Integrate Monitor)	USE: when there is GBS sentence (in nomaly, USE is displayed).

8.4 DIAGNOSTICS

Choosing [MENU] -> DIAGNOSTICS and pressing the [ENT] key displays the menu below. In this section, description of FOR SERVICE is excluded.

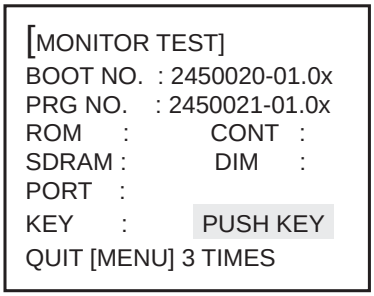


8.4.1 MONITOR TEST

Choosing MONITOR TEST and pressing the [ENT] key will automatically start the monitor test. When this test is finished, "QUIT [MENU] 3 TIMES" message will be shown. (Press the [MENU] key three times to exit the test.)

Self test Part-1)

Pressing the key while "PUSH KEY" is being displayed shows the key OK indication in the KEY column. Pressing the [▲] key moves the cursor "UP" and the [▼] key "DOWN." If no key is pressed, the process moves to ***Self test Part*** -2 after about 5 seconds.



Self test Part -2)

RAM, SDRAM and PORT are checked. OK or NG indications are shown, and when this test is completed, the self-test process automatically advances to the next step.

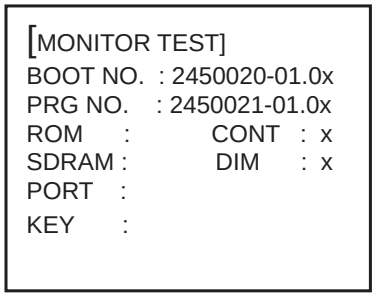
- PORT: Loop back (transmission and reception) test of a serial data line. If testing just the display without a processor unit connected, connect between TD-A and RD-A, and between TD-B and RD-B of the display with jumper wires. If the processor unit is connected, no jumpers are required. A specific character string will be sent / looped back during this test. If it is received, the PORT is considered OK.

- ROM: A total sum from the beginning to the last of ROM is calculated. If it coincides with the checksum written at the last ROM, it is judged OK.

- RAM: Specific data is written in a specific area of RAM and the ability to read it is checked. If this WRITE / READ functionality check is confirmed, RAM is considered OK.

Self test Part -3)

The LCD contrast is changed in three stages (48, 32, 56). Then the LCD and key dimmers are changed in four stages (4, 1, 3). When this test is finished, the process automatically advances to the next step.



Self test Part-4)

This process checks the LCD. During this test, all the LCDs are turned ON for 2 seconds (maximum contrast.). Then, all the LCDs are turned OFF (minimum contrast) for 3 seconds. When this test is finished, the process automatically returns to Self test Part-1.

8.4.2 TRANSPONDER TEST

FA-1501 memory test and built-in GPS test are carried out.

1. MEMORY TEST

```
[MEMORY TEST]
PROGRAM NO.
      2450018-01.0x
MAIN ROM : OK
MAIN RAM : OK
SUB RAM  : OK
```

- PROGRAM NO.: FA-1501 program number is displayed.
- MAIN ROM: This is to check FLASH RAM (U25) for MAIN CPU of MAIN board. OK or NG is displayed by the result of the Check-sum check of ROM.
- MAIN RAM : This is to check RAM (U24) for MAIN CPU of MAIN board. OK or NG is displayed by the result of the Read/Write.
- SUB RAM : This is to check RAM (U2 and U8) for SUB CPU of MAIN board. OK or NG is displayed by the result of the Read/Write.

2. GPS TEST

When this test is executed, the command to start the self test is sent from FA-1501 to built-in GPS receiver, and the test begins. The test results are displayed.

```
[GPS TEST]
PROGRAM NO.
   4850264005
TEST: OK/NG
   (NG List)
```

When NG is displayed, the content of NG includes the following:

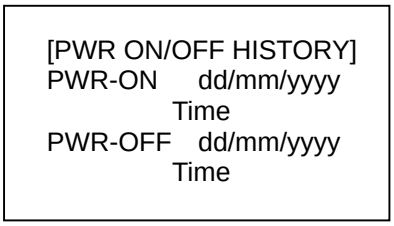
- ROM ERROR;
  When ROM error is found in GPS core board (GN 8093).
- RAM ERROR;
  When RAM error is found in GPS core board (GN 8093).
- ANT ERROR;
  Current that flows in GPS ANT is checked. If the current is not within the specified tolerances, ERROR is displayed.

- DATA BACKUP ERROR;
  This error is shown when there is no backup data of GPS data and WAAS data of GPS core board (GN 8093).
- PARAMETER BACKUP ERROR;
  This error is shown when there is no backup data of receiver parameters of GPS core board (GN 8093).
- GPS COMMUNICATION ERROR;
  This error is shown when there is no response from GPS core board (GN 8093).

Note:
When DATA BACKUP ERROR or PARAMETER BACKUP ERROR is displayed, electric charge of backup capacitor (C312: 1F) of MAIN board is empty.
The backup time of this capacitor is about 1 week.

8.4.3 PWR ON/OFF HISTORY

The PWR ON/OFF HISTORY log shows the date and time of the latest 30 power-ons and power-offs. If the interval between power-off and power-on is less than 15 minutes those times are not shown.



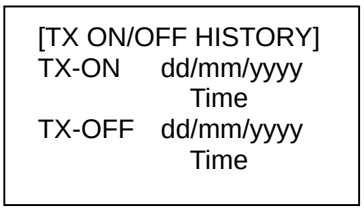
Reference: A. 917 excerpt: Operation of the transceiver unit

21; AIS should always be in operation when ships are underway or at anchor. If the master believes that the continual operation of AIS might compromise the safety or security of his/her ship, the AIS may be switched off. This might be the case in sea areas where pirates and armed robbers are known to operate. Actions of this nature should always be recorded in the ship's logbook together with the reason for doing so. The master should restart the AIS as soon as the source of danger has been removed. If the AIS is shut down, static data and voyage related information remains stored. Restart is done by switching on the power to the AIS unit. Ship's own data will be transmitted after a two minute initialization period. In ports AIS operation should be in accordance with port requirements when in port.

8.4.4 TX ON/OFF HISTORY

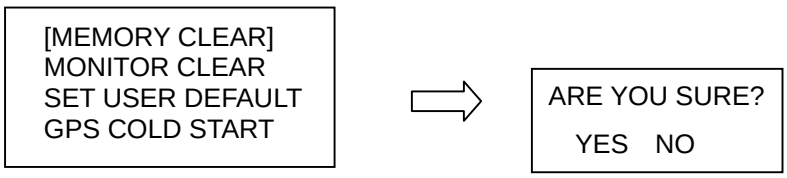
The TX ON/OFF HISTORY log shows the date and time of the latest 30 transmissions. The conditions of transmission stop to be stored include the following:

- When POWER is set to 0 W or MODE of CH-A and CH-B is set to RX in [MENU] -> DIAGNOSTICS -> FOR SERVICE -> CH & PWR SETTINGS.
- When POWER is set to 0 W or MODE of CH-A and CH-B is set to RX in [MENU] -> CHANNEL SETTINGS -> EDIT CHANNEL.



8.4.5 MEMORY CLEAR

The memory contents may be cleared (separately) as shown below:



- MONITOR CLEAR;
  [MENU] -> USER SETTINGS is cleared with exception of LR MODE.
- SET USER DEFAULT;
  [MENU] -> USER SETTINGS is cleared and [NAV STATUS] is cleared.
- GPS COLD START;
  Built-in GPS receiver begins cold start.

Reference:

To clear all the settings, execute [MENU] -> DIAGNOSTICS -> FOR SERVICE -> OTHER -> ALL CLEAR. See page 8-25.

8.5 FOR SERVICE

Password is required to enter this menu.

```
[FOR SERVICE]
CH & PWR SETTINGS
TX TEST
RX TEST
I/O PORT TEST
ALRM HISTORY
I/O MONITOR
OTHER
```

Password entry: Order of key entries

[UP], [DOWN], [LEFT], [RIGHT],
[NAV STATUS], [DIM], [DISP],
[ENT], [MENU], [NAV STATUS]

8.5.1 CH & PWR SETTINGS

When CH SET is set to MAUAL, AIS operating channels and output power can be set manually. The channels that are able to set up are international channels.
If CH SET is set to MANUAL, even when the ship enters the Regional operating area by AIS message: MSG22, etc., the ship is operated by the value set in this part of the section.

***** Keep the CH SET setting to AUTO. *****

```
[CH & PWR SETTINGS]
POWER   :   12.5W
CH NO.      CH-A   : 2087
            CH-B   : 2088
MODE        CH-A   : TX/RX
            CH-B   : TX/RX
CH SET : AUTO
```

- Power : 0 W, 1 W, 2 W, 12.5 W
- CH No. : International channel
- Mode : Tx/Rx, Rx, Unused
- CH SET: Auto/Manual

Reference:

Channels in operation and output power can be confirmed by [MENU] -> CHANNEL SETTINGS -> VIEW CHANNEL.

```
[VIEW CHANNEL]
POWER   : 1W

CHANNEL NO.
CH-A   :   1001
CH-B   :   1003
           (MANUAL)
         QUIT [MENU]
```

(MANUAL)
This is displayed when CH SET is set manually in CH & PWR SETTINGS. Setting takes place automatically if this display is not present.

8.5.2 TX TEST

This is a menu used when output power is measured.
See Chapter 7 Measurement.

```
[TX TEST]
PATTERN:   PN_PATTERN



TX START   [DIM]
TX STOP    [MENU]
```

8.5.3 RX TEST

When this test is carried out, remove the antenna so that noise does not input from the outside. This test is a loop back test and is carried out in the channel currently set.
A specific test message is transmitted several times and if more than one half the signal transmissions can be detected, the board is judged OK, and if NG, the board is judged trouble.
The test message content is:

- RX1 and 2 : MSG-1 (transmitted 12 times)
- DSC : Position message to own ship (transmitted 5 times).

The test signals are received by PA turned OFF and leakage from the Driver circuit which is received by RX1, RX2 and DSC boards. “Leakage” is carried out through the coaxial connector of J1: RX RF line. The leakage signal level is about -96 dBm in terms of antenna input.

```
[RX TEST]
RX1      :  OK
RX2      :  OK
DSC      :  OK
```

8.5.4 I/O PORT TEST

This is a loop back test of the I/O port.
When this test is performed, ports that are to be tested should be connected with jumpers in accordance with the table below. Note that the MODE setting in SET I/O PORT menu does not matter when this test is being done, and the test will be carried out based on the current I/O port SPEED seting. The test results are OK if a specific sentence is transmitted and the I/O port can receive that same sentence.

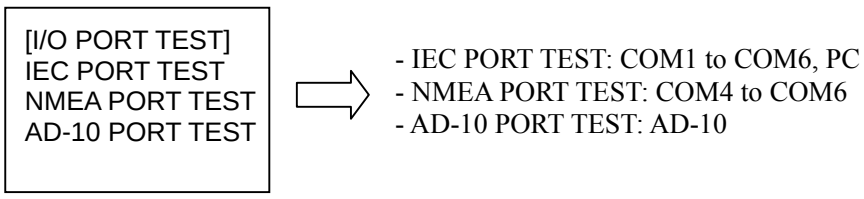

[I/O PORT TEST]
IEC PORT TEST
NMEA PORT TEST
AD-10 PORT TEST
- IEC PORT TEST: COM1 to COM6, PC
- NMEA PORT TEST: COM4 to COM6
- AD-10 PORT TEST: AD-10

Table 8.5.1 IEC port test

IEC PORT TEST:	Port	Pins to be Jumpered
COM1	COM 1	1:TDA – 4: RDA, 2:TDB – 5: RDB
COM2	COM 2	1:TDA – 4: RDA, 2:TDB – 5: RDB
COM3	COM 3	1:TDA – 4: RDA, 2:TDB – 5: RDB
COM4	COM 4	1:TDA – 4: RDA, 2:TDB – 5: RDB
COM5	COM 5	1:TDA – 4: RDA, 2:TDB – 5: RDB
COM6	COM 6	1:TDA – 4: RDA, 2:TDB – 5: RDB
PC	PC	2:SD – 3:RD

Table 8.5.2 NMEA port test

NMEA PORT TEST	Port	Pins to be Jumpered
COM4	COM 4	1:TDA – 9: RDA, 2:TDB – 10: RDB
COM5	COM 5	1:TDA – 9: RDA, 2:TDB – 10: RDB
COM6	COM 6	1:TDA – 9: RDA, 2:TDB – 11: AD DAD-C

Table 8.5.3 AD-10 port test

AD-10 PORT TEST	Port	Pins to be Jumpered
AD-10	COM 5 COM 6	COM 5-#1:TDA – COM 6-#12: AD CLK –H COM 5-#2:TDB – COM 6-#13: AD CLK –C
	COM 6	1:TDA – 10: AD DATA-H 2:TDB – 11: AD DATA-C

8.5.5 ALARM HISTORY

When alarms occurred, the date and time which they occurred are shown.
A maximum of 25 alarm incidents are stored in memory. This data is stored even if the power supply is turned off.

```
[ALARM HISTORY]
ANT       25/JUN 06:38:19
TX        25/JUN 06:38:19

PAGE(1/5): [<>]   QUIT [MENU]
```

Reference:

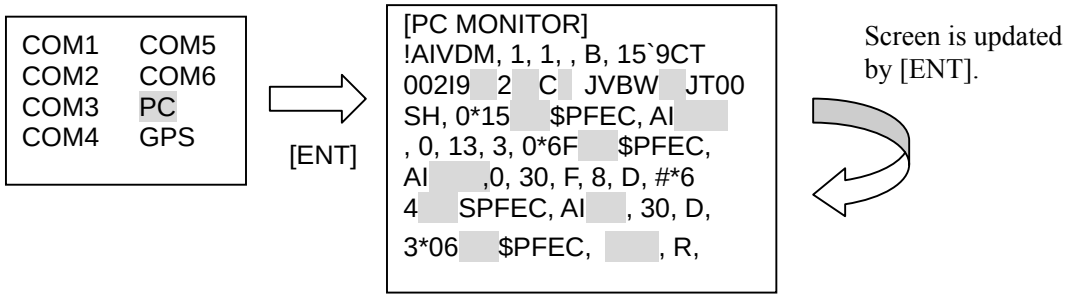
Pressing the [DISP] key several times to open the [ALARM STATUS] screen displays the alarm which are currently active.

```
[ALARM STATUS]
ANT       25/JUN 06:38:19
TX        25/JUN 06:38:19

PAGE(1/5): [<>]   QUIT [MENU]
```

8.5.6 I/O MONITOR

I/O MONITOR displays input data of any specific I/O port.
Only upper-case ASCII characters are shown, and all other characters appear blanked / black. Pressing the [ENT] key refreshes the data display.
For example, in the event that the SPEED setting in SET I/O PORT menu does not coincide with the data speed of a device connected, (GPS, for example,) character strings with no meaning are displayed.



8.5.7 OTHER

1. SIM MODE

This is a simulator mode.
External GNSS data, internal GPS data and heading data are not required.
Simulation “1” displays simulated targets of 9 ships in the Tokyo Bay area, while simulation “2” displays simulation targets of 5 ships in the Osaka Bay area. In addition, the simulation-related data: VDM and VDO sentences related to the simulation are outputted to the outside in the same as normal operation. For MMSI, IMO NO, ANT POS and other static data and navigation data, set values are used. The simulated position data appears as if it were being fed by a GPS in each of the simulated areas. When AIS enters the simulator mode, “S” is displayed at the top right end of all the screens. This mode is maintained even if the power supply is turned off.

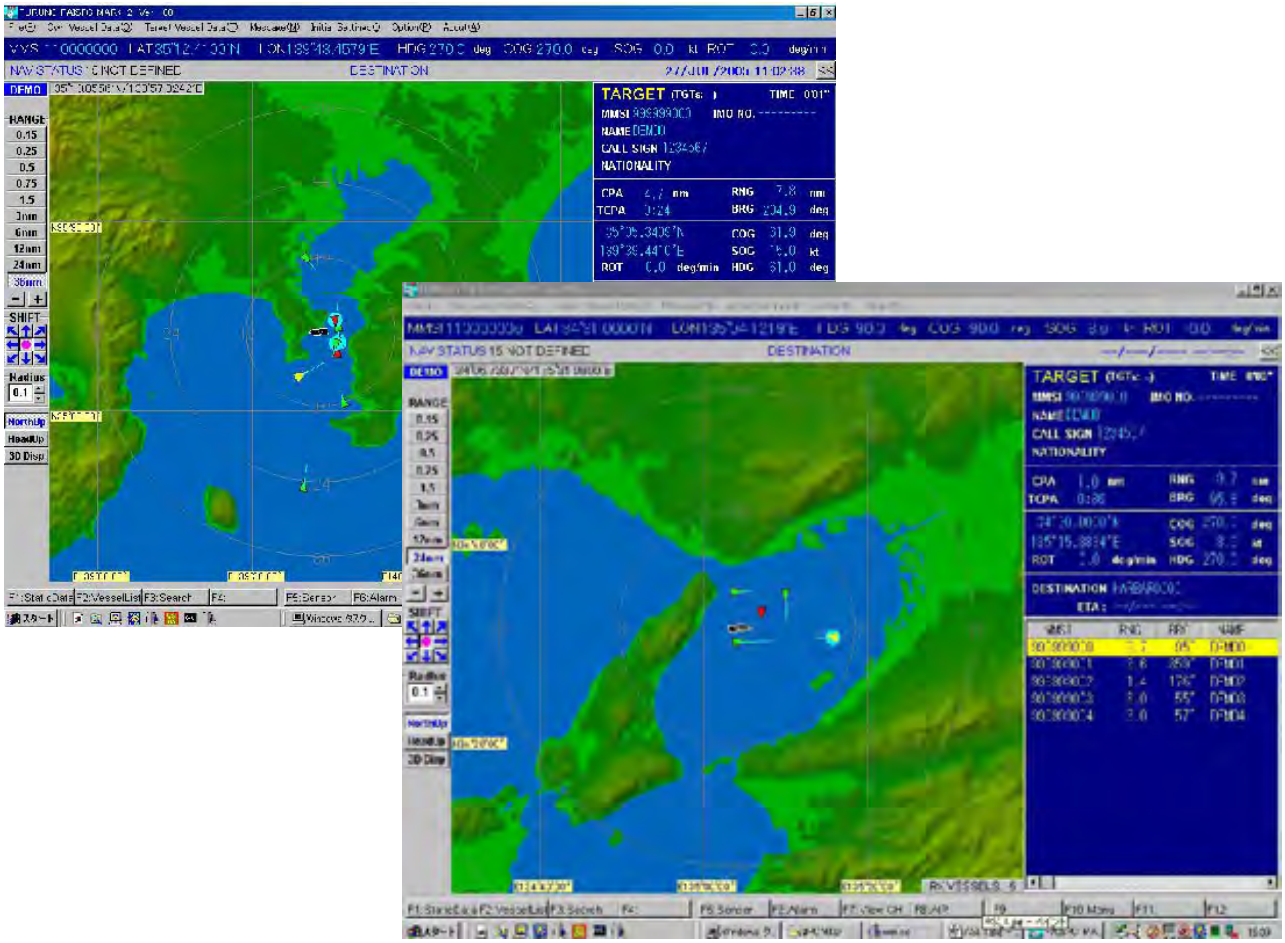


Fig. 8.5.1 Location of ships in the simulator mode

Table 8.5.4 Own ship data in the simulator mode

Own Dynamic Data	1: Tokyo Bay	2: Osaka Bay
DATE	Present date/time	Present date/time
LAT	35° 12.410'N	34° 31.000'N
LON	139° 43.458'E	135° 04.000'E
SOG	0.0 kt	8.0 kt
COG	270.0°	90°
ROT	0.0° /min	0.0° /min
HDG	270.0°	90°
PA	H	H
GPS	EXT DGPS	EXT DGPS
RAIM	UNUSE	UNUSE

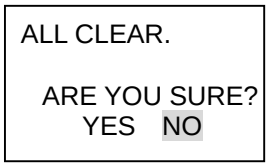
Table 8.5.5 Other ship data in the simulator mode

Target Name	MMSI	1: Tokyo Bay		2: Osaka Bay	
		Default of Pos.	SOG	Default of Pos.	SOG
DEM0	999999000	35° 05.146N 139° 38.996E	15, 12, 8, 5, 4 kt Variable	34° 30.000N 135° 16.000E	8.0 kt
DEM1	999999001	35° 24.319N 139° 40.447E	28, 8, 10, 12, 8, 3, 6, 8 kt Variable	34° 34.567N 135° 04.000E	8.0 kt
DEM2	999999002	35° 00.948N 139° 48.116E	6, 5, 7, 8, 6, 4 kt Variable	34° 29.567N 135° 04.000E	16.0 kt
DEM3	999999003	35° 10.408N 139° 47.138E	12, 10, 1, 3, 7, 8 kt Variable	34° 34.567N 135° 10.110E	12.0 kt
DEM4	999999004	35° 47.279N 139° 40.195E	16, 12, 10, 8, 5 kt Variable	34° 32.621N 135° 07.1790E	0.0 kt
DEM5	999999005	35° 08.593N 139° 46.916E	15, 12, 8, 5, 4, 15 kt Variable		
DEM6	999999006	35° 12.755N 139° 47.076E	12, 8, 5, 4, 15 kt Variable		
DEM7	999999007	35° 14.497N 139° 46.398E	8, 7, 6, 5, 2, 4, 5 kt Variable		
DEM8	999999008	35° 10.747N 139° 46.546E	7, 6, 5, 2, 4, 5, 8 kt Variable		

2. ALARM MODE
See Page 3-22.

3. CH MODE
See Page 3-23.

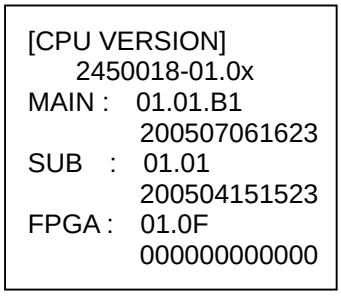
4. ALL CLEAR
All the settings return to default values.



Choose YES and press the [ENT] key.
During initialization, the following display is popped up.

Reference:
In [MENU] -> DIAGNOSTICS -> MEMORY CLEAR, the following memory may be cleared:
- MONITOR CLEAR;
  [MENU] -> USER SETTINGS clear and LR MODE are excluded.
- SET USER DEFAULT;
  [MENU] -> USER SETTINGS clear and [NAV STATUS] clear.

5. DEBUG MENU
CPU VERSION
Each number display of MAIN, SUB and FPGA are control number of R&D.
The released program and control No. are linked.



Reference:
Normally, the program version can be confirmed by [MENU] -> DIAGNOSTICS -> MONITOR TEST and TRANSPONDER TEST.

A/D MONITOR

With this test, the output power condition and antenna status can be confirmed.
The displayed content is MONI voltage value (VF) and R-VSWR voltage value (VR), and settings of output power.
However, VF and VR value are shown the highest level value within every second. For example, if 12.5 W output is set and transmission is not carried out, VF is 21 and VR is 39 but when transmission is carried out, VF is raised to 241 and VR to 58.
VF and VR are varied in accord with the antenna condition. VF and VR (in the table below) are threshold values when "TX" and "ANT" errors are detected.

Table 8.5.6 VF and VR threshold values

Output	VR value	VF value	REF
1 W	62	50	76
2 W	75	70	90
12.5 W	137	149	172

TX error conditions

- When the VF value is lower than the threshold value of the table below.
- When the VF value is greater than the threshold value of the table below when transmission is not carried out.
- When TX PLL is UN-LOCK.

ANT error conditions

When the ANT value is higher than the VR value of the table below.

Note:

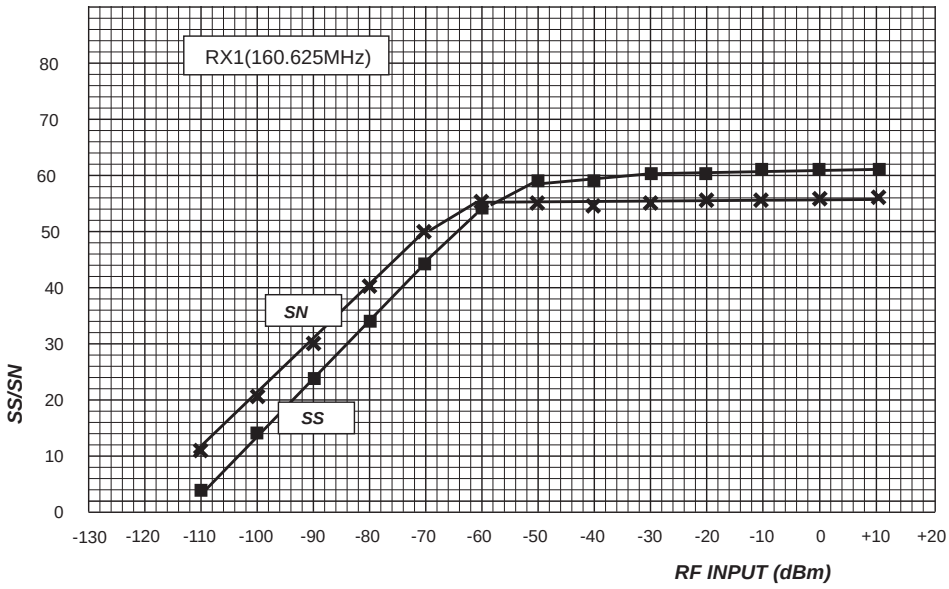
When ANT error occurs, TX error occurs, too.

Table 8.5.7 Measured examples of VF and VR

Power	ANT 50 ohm				ANT-terminal open				ANT-terminal short-circuited			
	VR value		VF value		VR value		VF value		VR value		VF value	
	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX
0 W	39	-	21	-	39	-	21	-	39	-	21	-
1 W	39	43	25	76	39	85	24	41	39	78	24	71
2 W	39	45	21	95	39	97	21	52	39	103	21	94
12.5 W	39	57	21	242	39	206	21	98	39	205	21	207

SS/SN MONITOR

Generally, SS is calculated and displayed. When SW2 of the MAIN board set as follows; SW2-#1: ON, SW2-#2, 3, 4: OFF, S/N is calculated and displayed.
SS/SN MONITOR indicates the intensity of SS (Signal Strings) signal and S/N (Signal/Noise), but under the normal operating condition, it is unable to judge whether the reception circuit is good or bad from this numerical value.
When the sensitivity of reception circuit is checked, that is, when the SS/SN value is measured, connect Standard Signal Generator to the antenna terminal and input carrier signals (non-modulation signal).



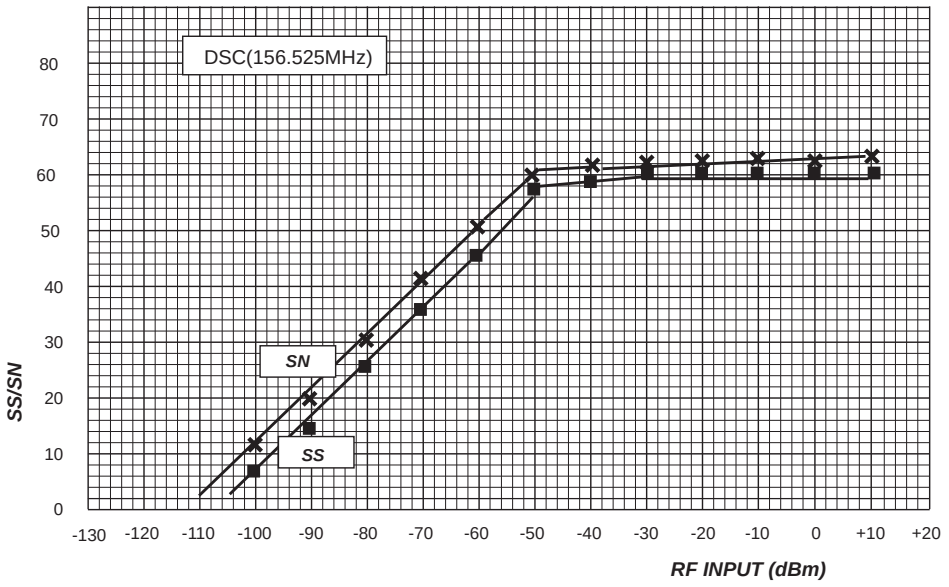


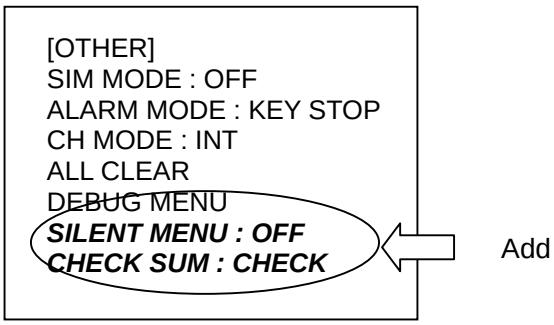
Fig. 8.5.2 SS/SN input to output

The following settings, SILENT and CHECKSUM are special-mode settings. Never disclose the setting password to the user!!

6. SILENT MENU

1. Calling up the SILENT menu.

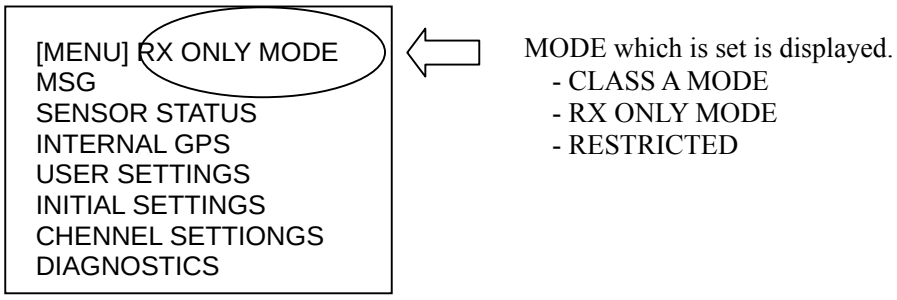
To enter this menu, turn ON the power while pressing [MENU] and [ENT] key. Then the password entry screen appears. Enter the password same as for FOR SERVICE menu. See page 8-19.



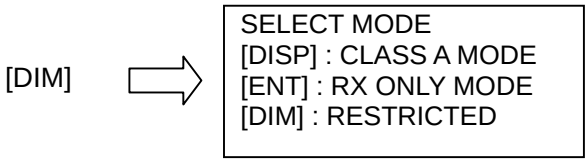
2. Set SILENT MENU to ON.

When SILENT MENU is set to ON, "CLASS A MODE," "RX ONLY MODE" or "RESTRICTED," which indicates SILENT MODE, appears on the lower right of the plotter screen or the [MENU] screen.

SILENT MODE holds this function even if the power supply is turned off.



3. Change over to SILENT MODE.
To change over, pressing the [DIM] key. SILENT MODE can be switched from any screen. When the SELECT MODE popup is displayed, press the key that corresponds to the MODE to be set.



- CLASS A MODE:
  Transmission and reception modes are enabled and normal AIS function (class A) is executed.
- RX ONLY MODE:
  Mode dedicated to reception.
- RESTRICTED:
  Reception, and MSG-6 (Binary Address Message) and MSG-8 (Binary Broadcast Message) only are allowed to be transmitted.

4. Set SILENT MENU to OFF.
Call the SILENT MENU again and set SILENT MENU to OFF.

7. CHECK SUM
The same method to call up the SILENT MENU in the previous page is used to enter this menu.
Even if the power supply is turned off, CHECKSUM settings are kept. To turn OFF this function, call up the CHECKSUM menu again and turn off the settings.

- CHECKSUM: CHECK
  The checksum field of input sentence is checked.
- CHECKSUM: UNCHECK
  The checksum field of input sentence is not checked. Even NMEA Ver 1.5 sentence can be accepted.

AIS requires IEC61162 sentence. When CHECKSUM is set to UNCHECK, it does not conform to the AIS regulations, to which care must be taken.

8.6 LED

8.6.1 MAIN board

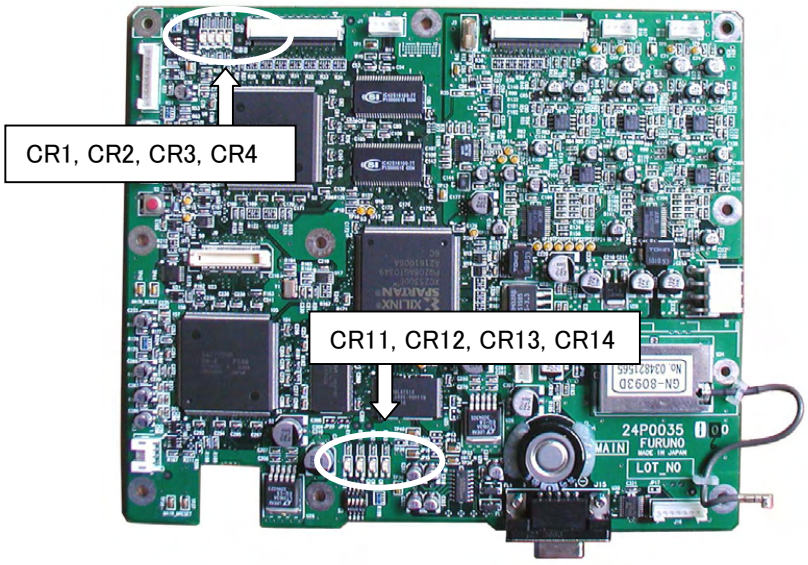


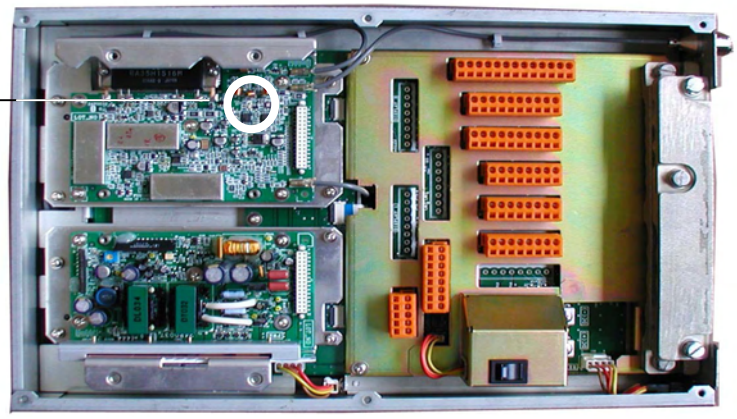
Table 8.6.1 MAIN board LED

LED	Description
CR1	Goes on when AIS signal is detected with RX1 board.
CR2	Goes on when AIS signal is detected with RX2 board.
CR3	For R&D Displays demodulation method of received signal of RX1 substrate (frequency demodulation, synchronous detection) Goes on in the case of frequency demodulation.
CR4	For R&D Displays demodulation method of received signal of RX2 board (frequency demodulation, synchronous detection) Goes on in the case of frequency demodulation.
CR11	LED for MAIN CPU - Blinks every 200 msec when the device operates in synchronism with GPS. - Blinks every second when the device operates in synch with anything other than GPS (other ship, VTS).
CR12	LED for MAIN CPU: goes on every TDMA slot timing.
CR13	LED for FPGA: goes on every TDMA slot timing. (FPGA controls MAIN CPU.)
CR14	LED for FPGA: blinks when DSC signal processing is in operation.

8.6.2 TX board

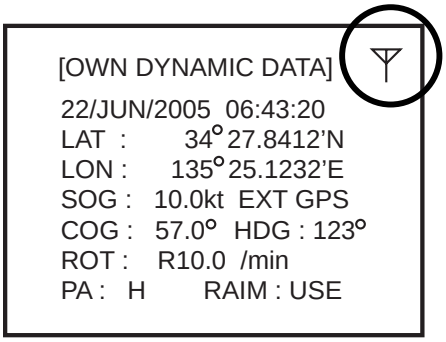
TX monitor detects output power of TX board (MONI signal) and TX board LED goes on in synch with output power. It goes on when the output power is about 0.5 W or more.

LED : CR6
(TX monitor)



Reference:

When transmission is made, the OWN DYNAMIC DATA antenna mark blinks. Leakage from PA board is detected by RX1 and RX2. "Leakage" is conducted through coaxial connector of the J1: RXRF line of the PA board.


[OWN DYNAMIC DATA]
22/JUN/2005 06:43:20
LAT : 34° 27.8412'N
LON : 135° 25.1232'E
SOG : 10.0kt EXT GPS
COG : 57.0° HDG : 123°
ROT : R10.0 /min
PA : H RAIM : USE

- Antenna mark is indicated:
  It indicates that the antenna is synchronous with UTC of built-in GPS. When external GPS is being used, no antenna mark is displayed.

- Antenna mark indication blinks:
  It indicates that message is being transmitted.

8.7 DIP Switch Settings

8.7.1 MAIN board

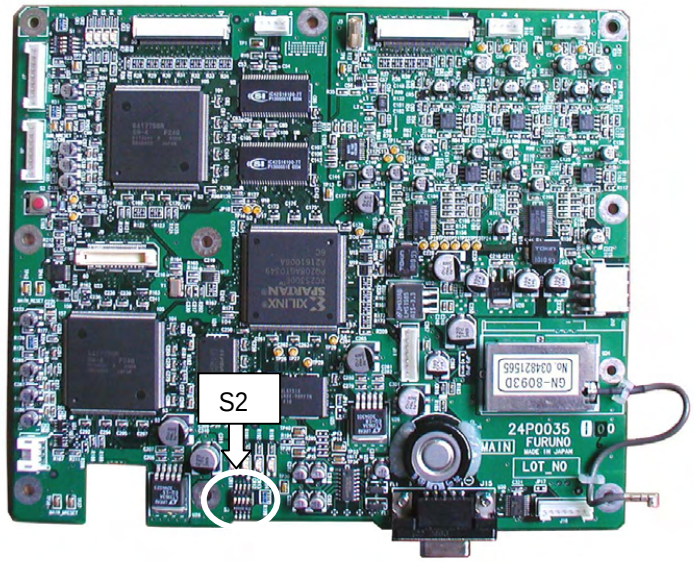


Table 8.7.1 SW2 function

SW 2				Function
#4	#3	#2	#1	
OFF	OFF	OFF	OFF	Normal mode
OFF	OFF	OFF	ON	RX adjustment/inspection mode #1-ON: SS, S/N MONITOR of DEBUG menu is displayed. #1-OFF: SS MONITOR of DEBUG menu is displayed.
OFF	OFF	ON	OFF	Slot No. is added to VDO, VDM sentences. Used when log is collected.
OFF	OFF	ON	ON	For R&D Under regular mode, PC port is operated at 57.6 kbps.
OFF	ON	OFF	OFF	For R&D DSC adjustment/inspection mode
OFF	ON	OFF	ON	Not used
OFF	ON	ON	OFF	Not used
OFF	ON	ON	ON	All clear All clear is carried out every time for turning ON the power supply.
ON	N/A	N/A	N/A	Not used

8.8 Popup message list

Table 8.8.1 List of popup messages

Popup display	Display conditions
TX	Transmission failure, transmission stop
ANT	Antenna VSWR trouble (the AIS unit continues operation.)
CH1	Failure of TDMA RX1 board
CH2	Failure of TDMA RX2 board
CH70	Failure of DSC TX board
FAIL	System failure in general
EPFS	Disconnection of external GNSS
L/L	No L/L data to use
SOG	No SOG information
COG	No COG information
HDG	No HDG information
ROT	No ROT information
COLLISION ALARM	CPA/TCPA alarm is initiated.
TRANSPONDER WAS REBOOTED.	Transponder is rebooted.
COMMUNICATION ERROR	Communication with transponder is stopped.
MKD	MKD input device is lost.
ENTER MMSI !	MMSI is not entered.
NOW INITIALIZING	Initializing when power supply is turned on.
NOW INITIALIZING TRANSPONDER.xxx%	Screen on which ALL CLEAR is being carried out.
NOW TRANSMITTING STOP: [MENU]	In transmission
FINISHED TRANSMITTING PRESS ANY KEY	When transmission is finished.
SELECT MODE [DISP]:CLASS A MODE [ENT] :RX ONLY MODE [DIM] :RESTRICTED	Screen to choose operating mode with [DIM] key held depressed when the mode is set to SILENT MODE.
[RAIM/PA] DATA CHANGED. PRESS ANY KEY	When RAIM/PA is changed.
CAN'T DISPLAY OVER LAT85 ° PRESS ANY KEY	In the PLOT screen, latitude exceeds 85 degrees.
MESSAGE ! PRESS ANY KEY	When message arrives.

[LR RESPONSE] MMSI:xxxxxxxxx NAME:xxxxxxxxxx xxxxxxxxxx xxxxxxxxxxxxxxxxxx PRESS ANY KEY	Long-range automatic response screen
[RECEIVED LR] MMSI:xxxxxxxxx NAME:xxxxxxxxxx xxxxxxxxxx xxxxxxxxxxxxxxxxxx RESPONSE? YES:[ENT] NO:OTHER	Long-range manual response screen
NOW SENDING.	Message is being transmitted.
NOW WAITING RESPONSE. PRESS ANY KEY	Message is being waited to receive.
SEND MESSAGE UNSUCCESSFUL. PRESS ANY KEY	Transmission failure (Broadcast)
SEND MESSAGE UNSUCCESSFUL. MMSI:xxxxxxxxx PRESS ANY KEY	Transmission failure (Individual calling)
SEND MESSAGE COMPLETE. MMSI:xxxxxxxxx PRESS ANY KEY	Transmission completed (Individual calling)
SEND MESSAGE COMPLETE. PRESS ANY KEY	Transmission completed (Broadcast)
[ERROR REGIST] INVALID MMSI PRESS ANY KEY	MMSI entry error
[ERROR REGIST] INVALID CHANNEL PRESS ANY KEY	Channel designation error
[ERROR REGIST] INVALID L/L (x) PRESS ANY KEY	Lat/Lon entry error
[ERROR REGIST] L/L SIZE ERROR PRESS ANY KEY	No region designation or region size error
[ERROR REGIST] PRIORITY ERROR PRESS ANY KEY	Region priority error
[ERROR REGIST] NOT 8 MILE AWAY FROM THE CORNER PRESS ANY KEY	8-mile error

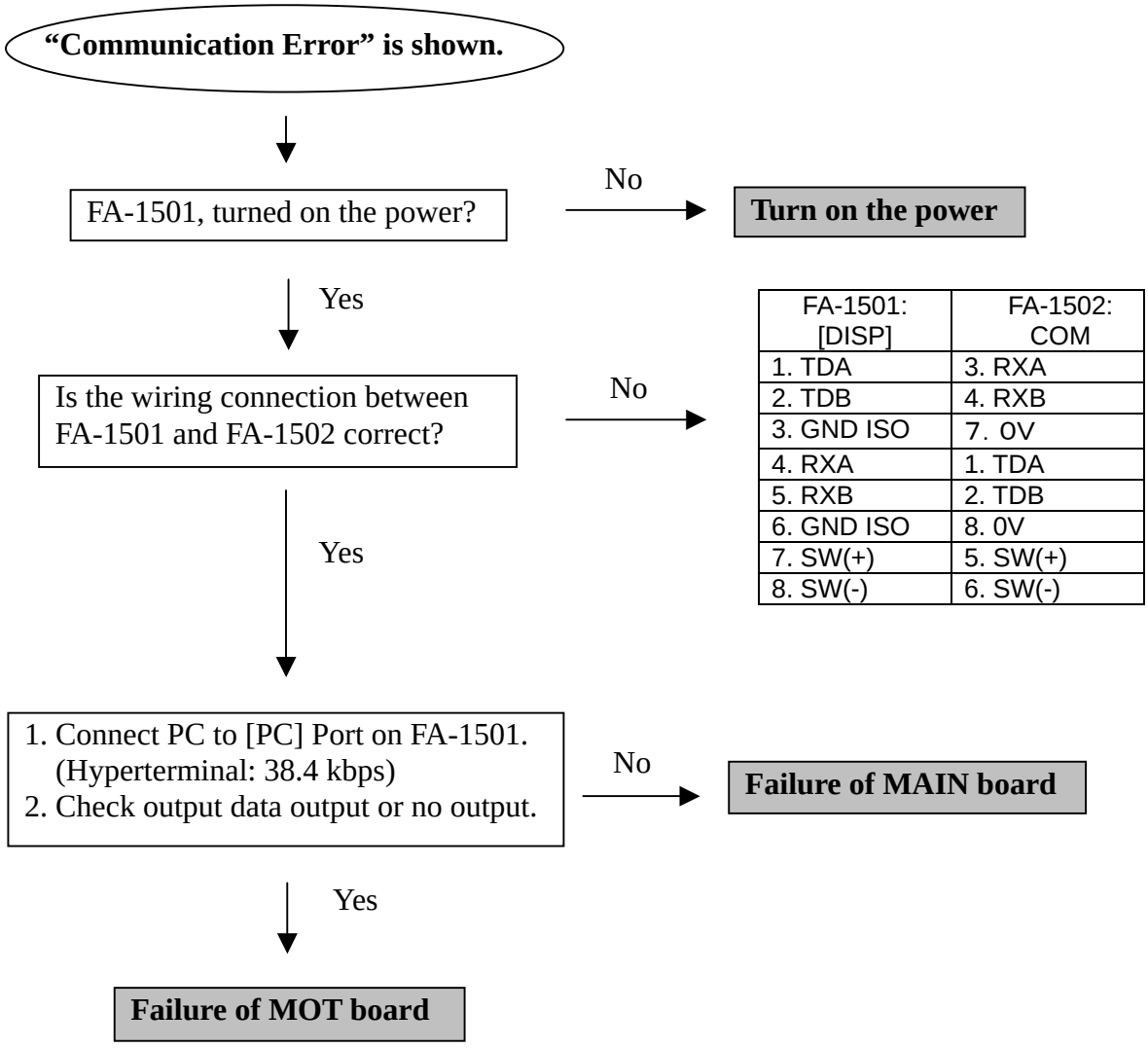
[PARAMETER ERROR] SENTENCE NO.: xxx KIND: FORMAT FIELD NO.: xx PRESS ANY KEY	Communication error between BB and MKD **BB: FA-1501, MKD: FA-1502 **
[PARAMETER ERROR] SENTENCE NO.: xxx KIND: DATA FACTOR NO.: xx PRESS ANY KEY	Communication error between BB and MKD
[PARAMETER ERROR] SENTENCE NO.: xxx KIND: MODE PRESS ANY KEY	Communication error between BB and MKD
CHANGE NAV STATUS? PRESS ANY KEY	When ship type is tanker and MOORED is chosen, ship speed exceeds 3 knot.
TX POWER CHANGED. (xxxW) PRESS ANY KEY	Transmission output changed
ILLEGAL MODE WAS SELECTED PRESS ANY KEY	In setting of transmission and reception mode, combinations other than designated are chosen.
NO MESSAGE PRESS ANY KEY	When “SEND MSG” is chosen, no transmission message is found.
NO SEL PRESS ANY KEY	Target with no data was attempted to be displayed in detail.
OUT OF RANGE !: CPA:0-6.00 PRESS ANY KEY.	Value entered in [CPA] of CPA/TCPA ALARM is outside the range.
OUT OF RANGE !: TCPA:0-60 PRESS ANY KEY.	Value entered in [TCPA] of CPA/TCPA ALARM is outside the range.
OUT OF RANGE !: NAV STATUS:0-15 PRESS ANY KEY.	Outside of range error in NAV STATUS -> NAV STATUS
OUT OF RANGE !: DESTINATION FULL PRESS ANY KEY.	NAV STATUS -> DESTINATION -> destination name FULL (MAX. 20 cases)
OUT OF RANGE !: DAY PRESS ANY KEY.	Outside of range error in NAV STATUS -> ARRIVAL TIME -> DATE
OUT OF RANGE !: HOUR:0-23 MINUTE:0-59 PRESS ANY KEY.	Outside of range error in NAV STATUS -> ARRIVAL TIME -> TIME
OUT OF RANGE !: CREW:0-8191 PRESS ANY KEY.	Outside of range error in NAV STATUS -> CARGO TYPE & CREW -> CREW
OUT OF RANGE !: TYPE NO:10-99 PRESS ANY KEY.	Outside of range error in NAV STATUS -> CARGO TYPE & CREW -> TYPE NO.
OUT OF RANGE!: DRAUGHT:0-25.5 PRESS ANY KEY.	Outside of range error in NAV STATUS -> DRAUGHT -> DRAUGHT

OUT OF RANGE !: 0-255 PRESS ANY KEY.	Outside of range error in I/O PORT -> LAN PORT -> IP ADDRESS Outside of range error in I/O PORT -> LAN PORT -> SUB NET MASK
OUT OF RANGE !: 0-65535 PRESS ANY KEY.	Outside of range error in I/O PORT -> SET LAN PORT -> PORT NO.
OUT OF RANGE !: ZONE:1-8 PRESS ANY KEY.	Outside of range of ZONE value of EDIT CHANNEL
OUT OF RANGE !: 0-511 PRESS ANY KEY.	Outside of range of A, B values of [SET INT ANT POS.] and [SET EXT ANT POS.] of INITIAL SETTINGS
OUT OF RANGE !: 0-63 PRESS ANY KEY.	Outside of range of C, D values of [SET INT ANT POS.] and [SET EXT ANT POS.] of INITIAL SETTINGS

8.9 Trouble Shooting

Case 1) "Communication Error" is shown.

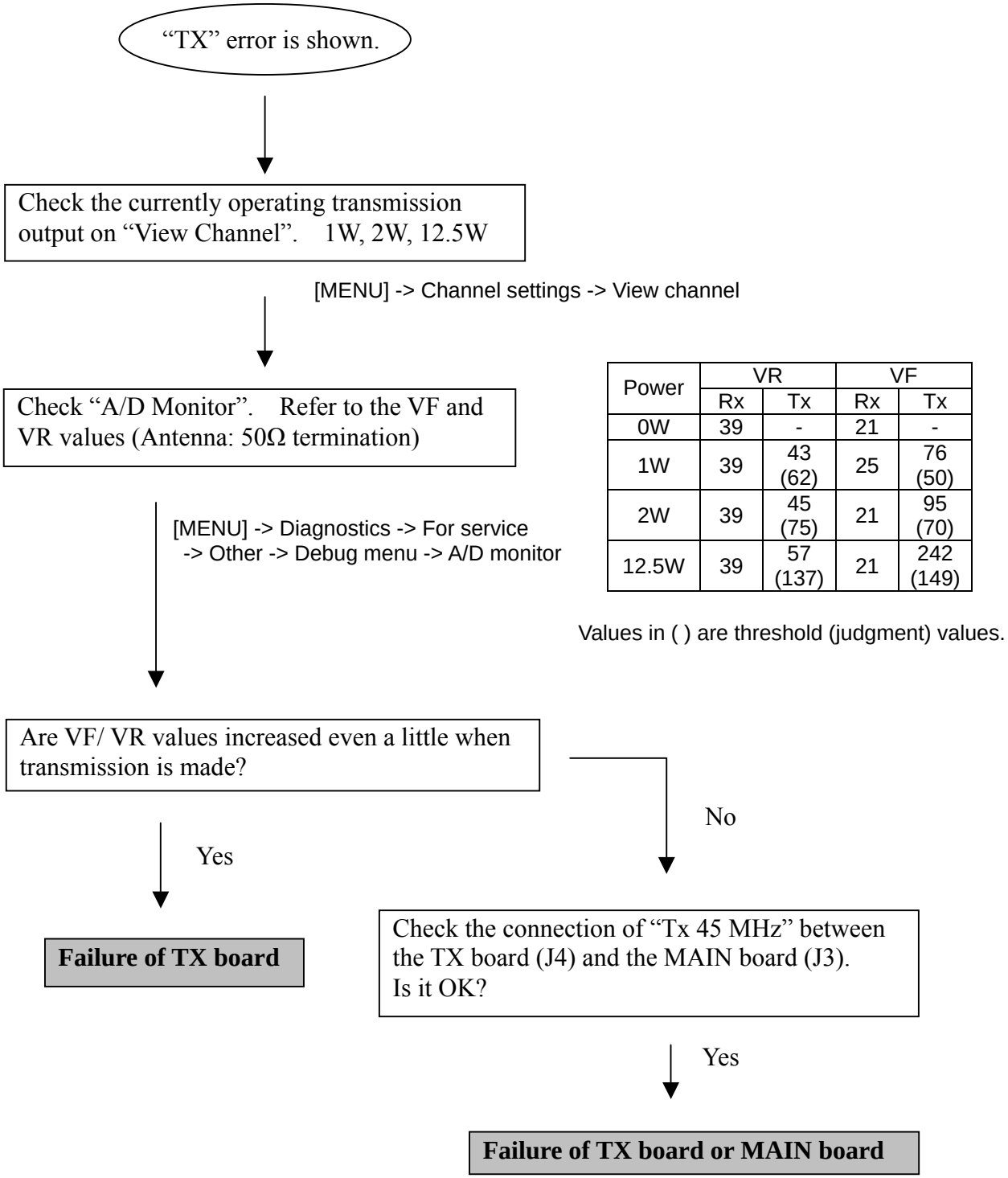
This error is shown when a communication error occurs between the MKD (FA-1502) and the transponder (FA-1501). See page 8-5.



FA-1501: [DISP]	FA-1502: COM
1. TDA	3. RXA
2. TDB	4. RXB
3. GND ISO	7. 0V
4. RXA	1. TDA
5. RXB	2. TDB
6. GND ISO	8. 0V
7. SW(+)	5. SW(+)
8. SW(-)	6. SW(-)

Case 2) "TX" error is shown.

This is an error of transmission output. The error occurs when transmission output is decreased, when transmission output is not detected, or when the PLL circuit on the TX board is unlocked. See pages 5-7 and 8-26.

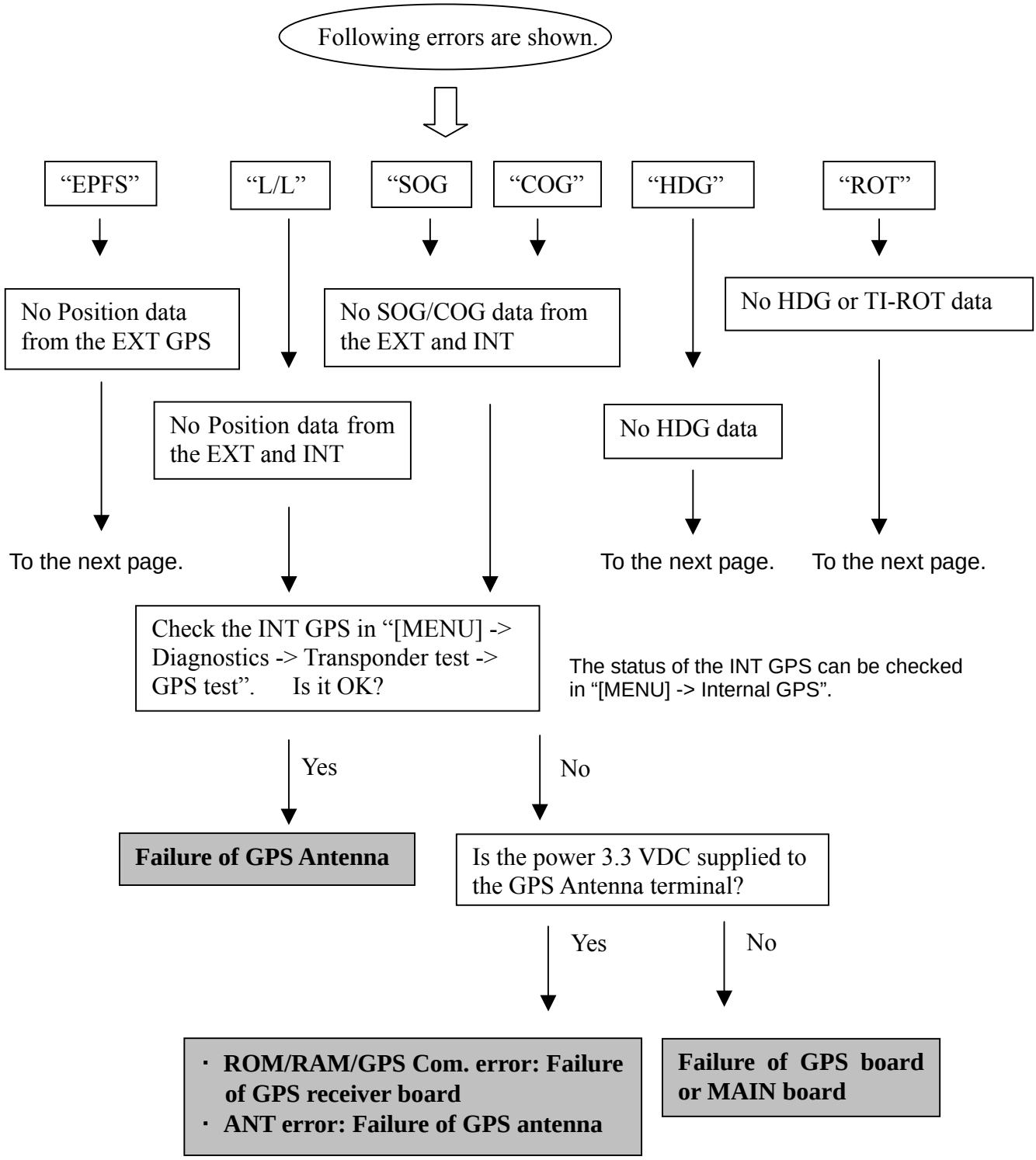

"TX" error is shown.
Check the currently operating transmission output on "View Channel". 1W, 2W, 12.5W
[MENU] -> Channel settings -> View channel
Check "A/D Monitor". Refer to the VF and VR values (Antenna: 50Ω termination)
[MENU] -> Diagnostics -> For service -> Other -> Debug menu -> A/D monitor
Are VF/ VR values increased even a little when transmission is made?
Yes
No
Failure of TX board
Check the connection of "Tx 45 MHz" between the TX board (J4) and the MAIN board (J3). Is it OK?
Yes
Failure of TX board or MAIN board

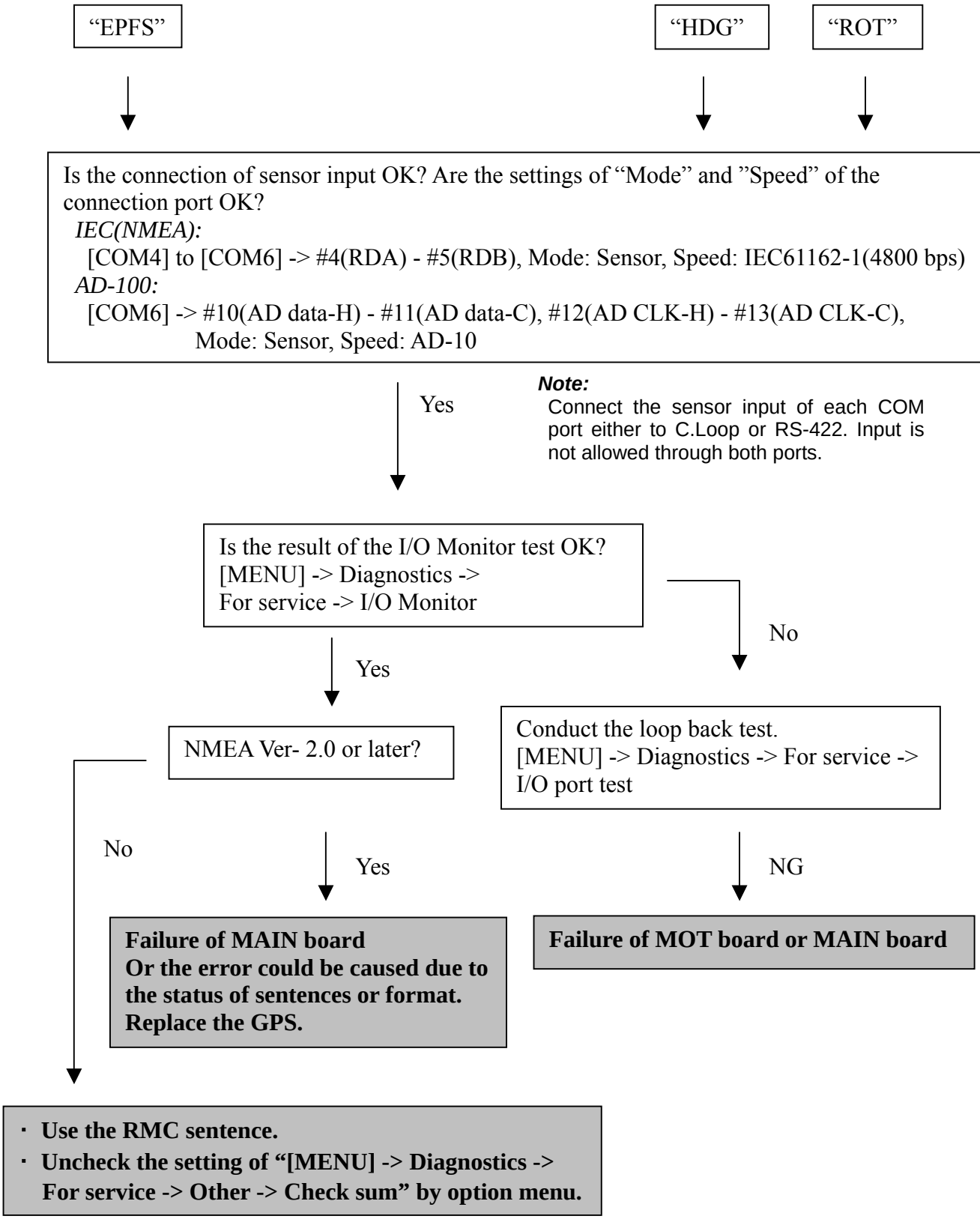
Power	VR		VF	
	Rx	Tx	Rx	Tx
0W	39	-	21	-
1W	39	43 (62)	25	76 (50)
2W	39	45 (75)	21	95 (70)
12.5W	39	57 (137)	21	242 (149)

Values in ( ) are threshold (judgment) values.

Case 3) EPFS, L/L, SOG, COG, HDT or ROT error is shown.

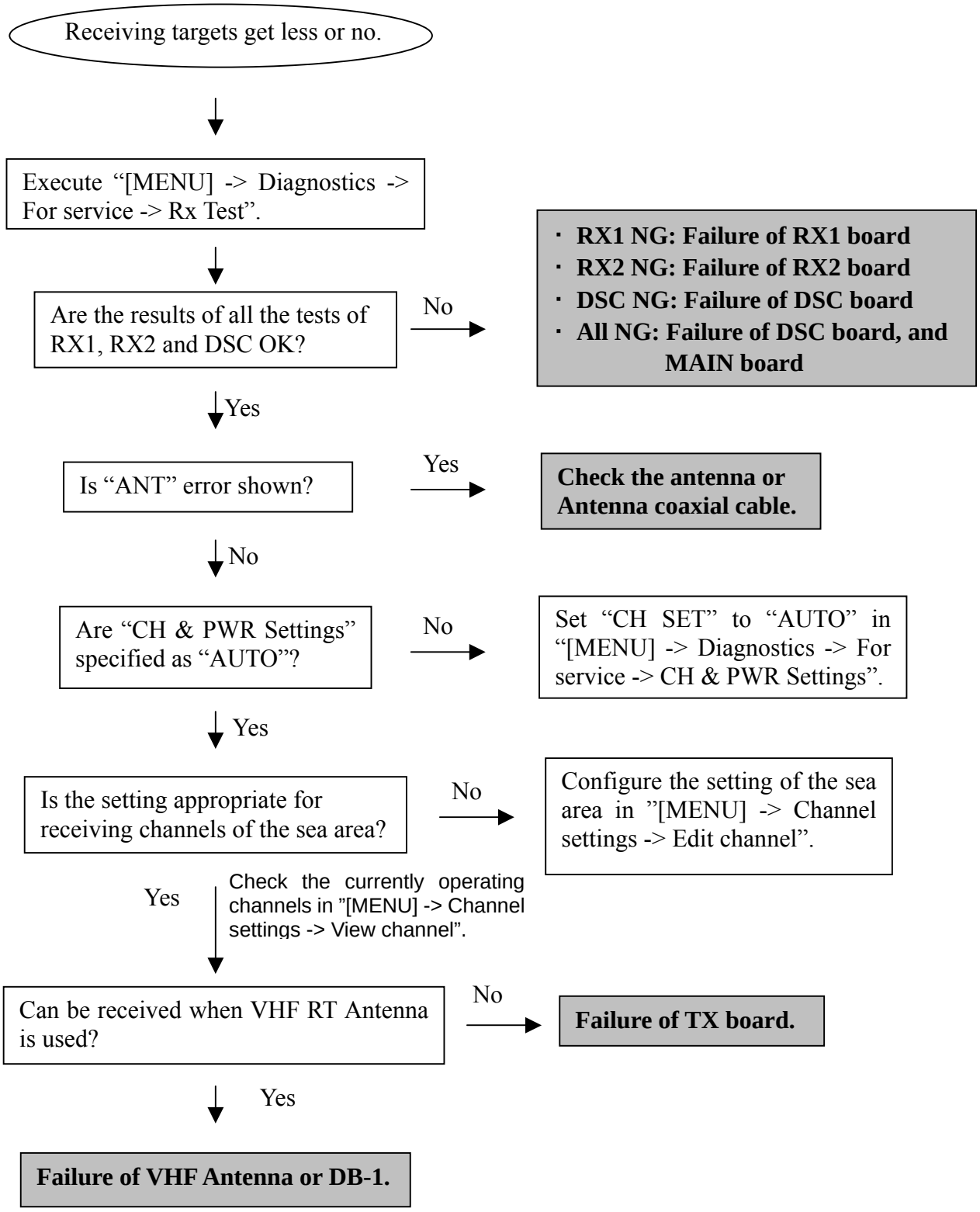
Sensor signals are not received. Check the reception condition of the Internal GPS ([Menu]-> Internal GPS), and the connection and setting of the External sensors.
The time-out of each sentence is 5 seconds. When data is not received for 5 seconds or more, a corresponding error is shown. A corresponding error is also shown when data is invalid. See pages 3-6, 8-4, 8-7, 8-22 and 8-29.


Following errors are shown.
"EPFS"
"L/L"
"SOG
"COG"
"HDG"
"ROT"
No Position data from the EXT GPS
No SOG/COG data from the EXT and INT
No HDG or TI-ROT data
No Position data from the EXT and INT
No HDG data
To the next page.
To the next page.
To the next page.
Check the INT GPS in "[MENU] -> Diagnostics -> Transponder test -> GPS test". Is it OK?
The status of the INT GPS can be checked in "[MENU] -> Internal GPS".
Yes
No
Failure of GPS Antenna
Is the power 3.3 VDC supplied to the GPS Antenna terminal?
Yes
No
· ROM/RAM/GPS Com. error: Failure of GPS receiver board
· ANT error: Failure of GPS antenna
Failure of GPS board or MAIN board


"EPFS"
"HDG"
"ROT"
Is the connection of sensor input OK? Are the settings of "Mode" and "Speed" of the connection port OK?
IEC(NMEA):
[COM4] to [COM6] -> #4(RDA) - #5(RDB), Mode: Sensor, Speed: IEC61162-1(4800 bps)
AD-100:
[COM6] -> #10(AD data-H) - #11(AD data-C), #12(AD CLK-H) - #13(AD CLK-C), Mode: Sensor, Speed: AD-10
Yes
Note:
Connect the sensor input of each COM port either to C.Loop or RS-422. Input is not allowed through both ports.
Is the result of the I/O Monitor test OK?
[MENU] -> Diagnostics -> For service -> I/O Monitor
No
Yes
Conduct the loop back test.
[MENU] -> Diagnostics -> For service -> I/O port test
NG
Failure of MOT board or MAIN board
NMEA Ver- 2.0 or later?
No
Yes
Failure of MAIN board
Or the error could be caused due to the status of sentences or format.
Replace the GPS.
・ Use the RMC sentence.
・ Uncheck the setting of "[MENU] -> Diagnostics -> For service -> Other -> Check sum" by option menu.

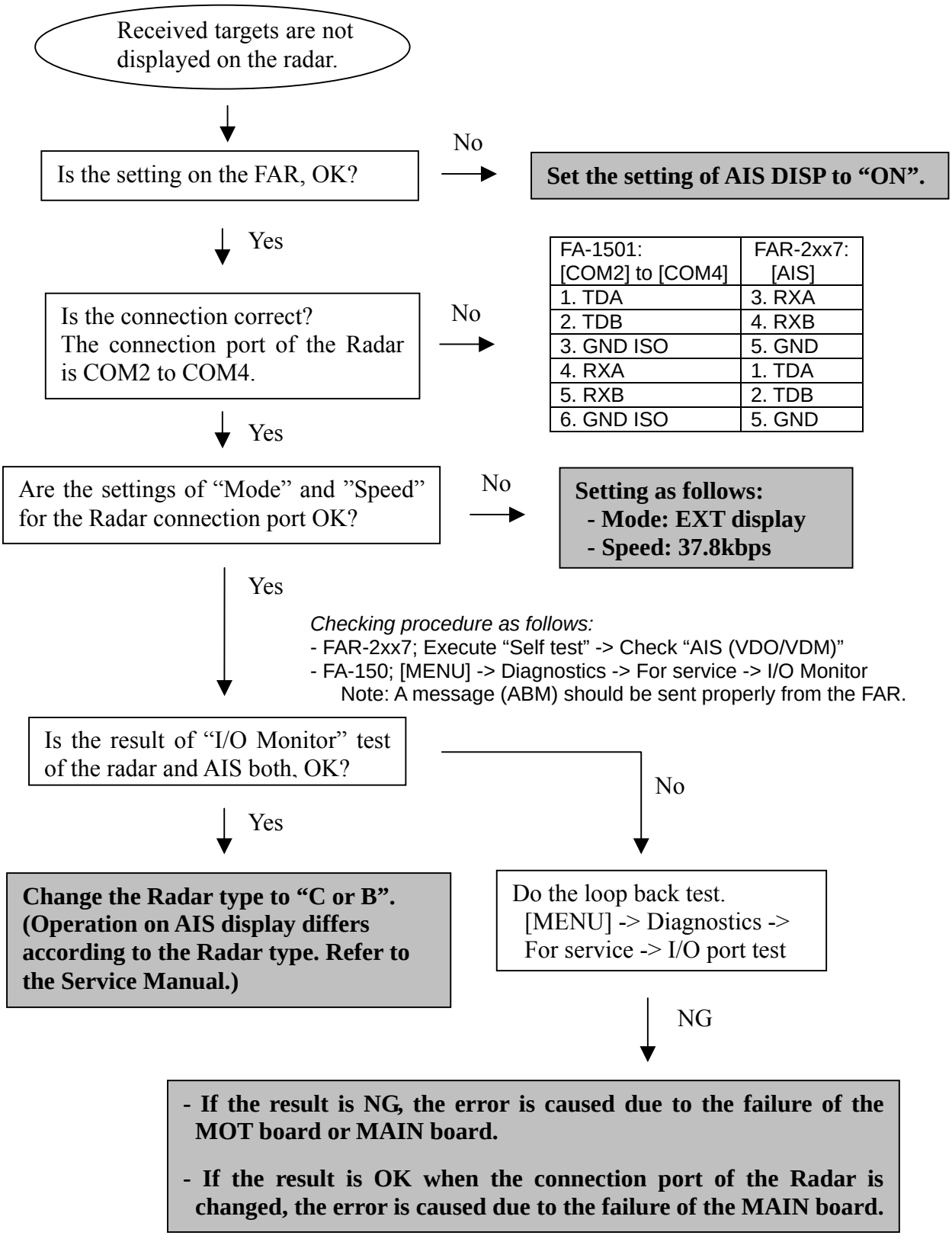
Case 4) Receiving targets get less or no.

The error may be caused when the receiving channel is not set appropriately for operating channels in the sea area, or when the receiver board or VHF Antenna is faulty.
See pages 3-24, 8-19 and 8-20.


Receiving targets get less or no.
Execute "[MENU] -> Diagnostics -> For service -> Rx Test".
Are the results of all the tests of RX1, RX2 and DSC OK?
No
· RX1 NG: Failure of RX1 board
· RX2 NG: Failure of RX2 board
· DSC NG: Failure of DSC board
· All NG: Failure of DSC board, and MAIN board
Yes
Is "ANT" error shown?
Yes
Check the antenna or Antenna coaxial cable.
No
Are "CH & PWR Settings" specified as "AUTO"?
No
Set "CH SET" to "AUTO" in "[MENU] -> Diagnostics -> For service -> CH & PWR Settings".
Yes
Is the setting appropriate for receiving channels of the sea area?
No
Configure the setting of the sea area in "[MENU] -> Channel settings -> Edit channel".
Yes
Check the currently operating channels in "[MENU] -> Channel settings -> View channel".
Can be received when VHF RT Antenna is used?
No
Failure of TX board.
Yes
Failure of VHF Antenna or DB-1.

Case 5) Received targets are not displayed on the Radar (FAR-2xx7 series)

The error may be caused due to the failure of wiring or setting. Check by the I/O signal monitor test on the FAR and AIS both. See pages 3-6, 8-21, 8-22 and AP4-3.


Received targets are not displayed on the radar.
Is the setting on the FAR, OK?
No
Set the setting of AIS DISP to "ON".
Yes
Is the connection correct?
The connection port of the Radar is COM2 to COM4.
No
Yes
Are the settings of "Mode" and "Speed" for the Radar connection port OK?
No
Setting as follows:
- Mode: EXT display
- Speed: 37.8kbps
Yes
Checking procedure as follows:
- FAR-2xx7; Execute "Self test" -> Check "AIS (VDO/VDM)"
- FA-150; [MENU] -> Diagnostics -> For service -> I/O Monitor
Note: A message (ABM) should be sent properly from the FAR.
Is the result of "I/O Monitor" test of the radar and AIS both, OK?
No
Yes
Change the Radar type to "C or B". (Operation on AIS display differs according to the Radar type. Refer to the Service Manual.)
Do the loop back test.
[MENU] -> Diagnostics -> For service -> I/O port test
NG
- If the result is NG, the error is caused due to the failure of the MOT board or MAIN board.
- If the result is OK when the connection port of the Radar is changed, the error is caused due to the failure of the MAIN board.

FA-1501: [COM2] to [COM4]	FAR-2xx7: [AIS]
1. TDA	3. RXA
2. TDB	4. RXB
3. GND ISO	5. GND
4. RXA	1. TDA
5. RXB	2. TDB
6. GND ISO	5. GND

Chapter 9. Q & A

Q1: Strange characters are displayed on the target list. What do they mean?

- No mark: Vessel
- Search and Rescue Aircraft: ▲ (Detecting from Msg. 9)
- Aids to Navigation: + (Detecting from Msg. 21)
- AIS Base Station: ■ (Detecting from Msg. 4)

Q2: It seems to take long time to display the Name of Ship. (See page 1-2.)

The Name of Ship, Call Sign, etc. are static data is transmitted every 6 minutes. In addition, they are transmitted when any data change occurs or polling is received from other ship or VTS. Wait for a while until the static data is received.

Q3: Does FA-150 have a polling function?

FA-150 has no polling function. However, on the PC-version display (PC MKD), polling can be carried out.

PC-version display software: FAISPC MARK2 is optional.

Q4: Second FA-1502 can be connected? (See page 3-28.)

Yes, it could. Connect the second FA-1502 to COM2 or COM3.

However, FA-1502 power control lines SW-H and C should be connected in parallel with the DISP port power control line.

Operation is equal for both No. 1 and No. 2 but [MENU] -> USER SETTINGS can be set independently, except the setting of Long Range of this menu.

Q5: COMMUNICATION ERROR is displayed. Where should I check?

It is displayed on FA-1502 when communication with FA-1501 is disabled. Check if FA-1501 power supply switch is turned ON. Check if the DISP port is correctly connected. See page 8-37.

Q6: Are settings of DIM and CONTRAST stored in memory even if the power is turned off?

Both settings are stored in memory. However, turning off the power supply with the contrast set to 35 or lower automatically sets the contrast to 36 when the power supply is turned on next time.

Q7: Where is the tanker mode setting carried out?

There is no setting such as "the tanker mode is turned ON/OFF." Under the following conditions, the system enters the tanker mode in which the transmission output is reduced to 1 W automatically.

- When No. 80: TANKER is chosen in [MENU] -> INITIAL SETTINGS -> SET SHIP TYPE;
- When MOORED is chosen in [NAV STATUS]; and
- When the ship speed is 3 knot or less.

When POWER becomes 1 W in [MENU] -> CHANNEL SETTINGS -> VIEW CHANNEL, the system is in the tanker mode. In addition, when the system enters the tanker mode, TX POWER CHANGED 1W popup display appears.
When the ship speed exceeds 3 knot with [NAV STATUS] set to MOORED, popup displays TX POWER CHANGED 12.5W and CHANGE NAV STATUS? appear. Users are prompted to change NAV STATUS with the message "CHANGE NAV STATUS?"

Q8. Is it possible to connect sensors to COM1, COM2 and COM3 ports?
(See page 3-11.)

Yes, it is, but it is the principle to connect the sensor input to COM4, COM5, or COM6. Note that priority of COM1, COM2, and COM3 are not higher than to COM4, COM5, and COM6. The related setting is [MENU] -> INITIAL SETTINGS -> SET I/O PORT -> SET PRIORITY. COM1, COM2, and COM3 ports do not have this kind of setting.

Q9: Is NMEA Ver-1.5 able to be used as sensor input? (See page 8-8 and 30.)

No, NMEA Ver-1.5 cannot be used as sensor input. The AIS is required IEC61162 sentence. Sentences of NMEA Ver-1.5 are no check-sum field.

Reference:

It is possible to set whether or not the check-sum is carried out in [MENU] -> FOR SERVICE -> OTHER -> CHECK SUM by carrying out the special operation.

Q10: How to check sensor input. (See pages 8-22 and 23.)

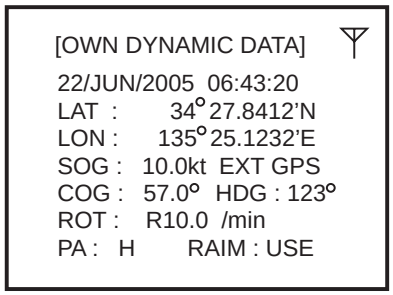
Choose the port to monitor the sentence by [MENU] -> FOR SERVICE -> I/O MONITOR. Irrespective of NMEA Ver, the input data can be monitored. However, the monitor displays only in uppercase. Lowercase is displayed smeared: half-toned, to which care must be taken.
If you cannot monitor the sensor data, check the connections of sensor port.
Other way, the I/O check of each port can be carried out by the loop back test. The test is carried out by [MENU] -> FOR SERVICE -> I/O PORT TEST.

Q11: How to check whether or not transmission is taking place.
(See pages 8-27 and 32.)

Simple methods to check whether or not transmission is taking place as follows.

- [TX] alarm is not displayed. This alarm detection is found from the Tx output power.
- When the antenna mark blinks to the transmission interval in the OWN DYNAMIC DATA screen, the message is being transmitted.
- When CR6 of TX board blinks to the transmission interval. When the Tx output power is about 0.5 W or higher, CR6 goes on.
- When the VF value increase in [MENU] -> FOR SERVICE -> OTHER -> A/D MONITOR, transmission is being taking place. In the no transmission period, the VF value is 20 to 25, when transmission is carried out at 12.5 W, the VF value increase to 200 to 250, and at 2 W, the VF value increases to 75 to 125.

Q12: What does the antenna mark on the top right of a screen for OWN DYNAMIC DATA? (See page 8-32.)


[OWN DYNAMIC DATA]
22/JUN/2005 06:43:20
LAT : 34° 27.8412'N
LON : 135° 25.1232'E
SOG : 10.0kt EXT GPS
COG : 57.0° HDG : 123°
ROT : R10.0 /min
PA : H RAIM : USE

Antenna mark is displayed.
It indicates that the system is being synchronized with UTC of built-in GPS. The antenna mark disappears if the system is not synchronized with the built-in GPS.

Antenna mark blinks.
It indicates that transmission is being carried out.

Q13: Can FA-150 receive Distress alert or Individual calling of VHF DSC?

FA-150 cannot receive Distress alert, Individual calling, All ship calling, etc. Even if it is the same channel (CH70) and signal format as VHF DSC, messages unrelated to AIS are not decode.

Q14: The alarm output (See pages 8-2 and 3-22.)

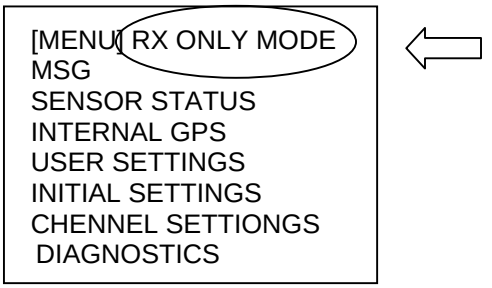
In AIS related alarm condition, alarm buzzer comes on and EXT ALM is activated, too. This condition continues until the ALM ACK signal is turned ON, any of the panel keys is pressed or the alarm event is removed.

In addition, the alarm is outputted by ALR sentences at every 25 seconds. If there is no error, the content of the ALR sentence, that is, messages "Alarm is General Failure and alarm condition is in the normal range (V)" are outputted at every 2 minutes. For the related setting, EXT ALM output form can be changed. The setting is carried out through [MENU] -> FOR SERVICE -> OTHER -> ALARM MODE.

Q15: What is the USCG mode? (See page 8-29.)

This mode is the function special for USCG and is the mode to change over Class A mode, Rx only mode or Restricted mode. These functions are changed over by the [DIM] key. SILENT ON/OFF is set by;

Turn on power while pressing [MENU] and [ENT] key, then press [MENU] -> FOR SERVICE -> OTHER -> SILENT MENU after carrying out the special operation.

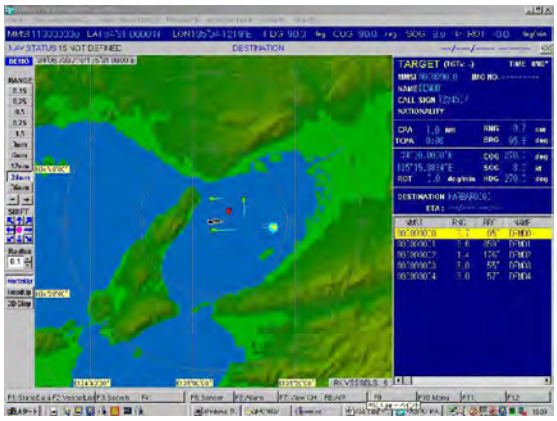


Any one of the modes which are set is displayed.
- CLASS A MODE (Normal mode)
- RX ONLY MODE (No Tx)
- RESTRICTED (Rx and Msg.6 and Msg.8 are allowed to be transmitted)

Q16: What is optional FAISPC-MARK2? (See AP5.)

FAISPC-MARK2 is PC-version display software.

PC is used by connecting it to the PC port or LAN port (optional).



Q17: I want to demonstrate FA-150 for an exhibition. (See page 8-24.)

Set it to the simulator mode. No connection of sensors is required.

This setting is carried out in [MENU] -> FOR SERVICE -> OTHER -> SIM MODE.

There are two kinds of this mode which simulate 5 vessels navigating the Osaka Bay area and 9 vessels navigating in the Tokyo Bay area.

In addition, same as normal condition, VDM and VDO sentences: simulation-related data are outputted.

For static data, such as MMSI, IMO No., ANT POS, and others, set parameters are used. The position data forms the status same as that when the data was inputted from the GPS. In addition, once the system enters the simulator mode, “S” is displayed in the upper right end of all the screens. This mode continues to hold this function even if the power is turned off.

Q18: Targets lost conditions

Signals from the target are not received at the time shown below, the target is lost target display. Furthermore, six minuets and 40 seconds after loss of signal the target's data is erased.

Ship's Maneuvering Condition	Time to change to lost targets
Ship at anchor or moored and not moving faster than 3 knots.	10 minutes
Ship at anchor or moored and moving faster than 3 knots.	50 seconds
Ship 0-14 knots	50 seconds
Ship 0-14 knots and changing course	50 seconds
Ship 14-23 knots	25 seconds
Ship 14-23 knots and changing course	25 seconds
Ship > 23 knots	7 seconds
Ship > 23 knots changing course	7 seconds

Reference:

FAR-2xx7 lost conditions include;

- The target is not received 5 times in the notification intervals of the target, and
- The target is not received for 6 minutes.

FA-100-side lost conditions;

- When the target is not received for more than 3 minutes and 20 seconds, the lost status appears. Furthermore, 3 minutes and 20 seconds after loss of signal the target's data is erased.

Q19: To which port should NAVNET 2 be connected? (See page 3-6.)

Connect to COM2 or 3 ports.

Setting of FA-150 COM port and NAVNET 2 are:

- FA-150 COM port; MODE -> HI LEVEL IF and SPEED -> 38.4 kbps.
- NAVNET2; DATA2 port used,
  BAUD RATE -> 38.4 kbps or AUTO in [MENU] -> E -> C -> A -> B(DATA2: NMEA PORT).

Q20: What sentences are VDO and VDM? (See pages AP4-16 and 17.)

VDO is a U-AIS VHF Data-Link Own-vessel message. Using this sentence, the data which FA-150 reported is outputted. In addition, every 1 second, the MSG.1 position report is outputted using this sentence. VDM is a U-AIS VHF Data-link Message. The received message is outputted using this sentence.

Q21: Could we use FA-100 GPS antenna?

For FA-150, the former GPS antenna and composite antenna set for FA-100 are unable to be used. Because the current consumption of the former GPS antenna is larger than the new model GPS, the use of the former GPS antenna causes the over current protection circuit of GPS core: GN-8093 incorporated into the FA-150 proper to work. However, in FA-100, both new and former GPS antennas can be used.
Identify the new and the former GPS antennas by SNo. of GPS antenna.
The model No. indicated on the GPS antenna is either GVA-100 or GSC-001 and it is unable to identify which is the new antenna and which is the former one.
The table below shows GPS antennas which can be used in FA-100 and FA-150.

	FA-100	**FA-150**	**Remarks**
Composite antenna	GVA-100-E		Former GPS, with no VHF ANT
	GVA-100-J		Former GPS, with VHF ANT
	GVA-100-T-E	GVA-100-T-E (for and after SNo. 4651)	New GPS, with no VHF ANT
	GVA-100-T-J	GVA-100-T-J (for and after SNo. 4651)	New GPS, with VHF ANT
GPS antenna	GSC-001-FA		
	GSC-001-FA-T	GSC-001-FA-T (for and after SNo. 100101)	
GPS core	GN-79	GN-8093	

Q22: What Msg. type should be selected when transmitting the test message?

It would be appropriate to set ADDRESS TYPE to ADDRESS CAST and MSG TYPE to SAFETY, and CHANNEL to BOTH. To test your AIS with other Furuno AIS, MSG TYPE may be set either to Normal or Safety but to test your AIS with other company's AIS, it is recommended to set MSG TYPE to SAFETY to ensure reliable communication.
This is because the handling of binary messages deffer in accord with equipment (manufacturers).

Reference:

- MSG-6; Binary data for addressed communication (DAC: 001, FI: 00)
- MSG-8; Binary data for broadcast communication (DAC: 001, FI: 00)
- MSG-12; Safety related data for addressed communication
- MSG-14; Safety related data for broadcast communication

Q23: Handling of messages

The table below shows handling of messages received.

Message	Data form	Output to FA-150 display	VDM serial data output	Received alarm (buzzer and popup display)	Ack transmission
MSG 6 Address-cast Normal	Binary	No	Yes	No	Yes
	Text	Yes	Yes	Yes	Yes
MSG 8 Broad-cast Normal	Binary	No	Yes	No	No
	Text	Yes	Yes	Yes	No
MSG 12 Address-cast Safety	Text	Yes	Yes	Yes	Yes
MSG 14 Broad-cast Safety	Text	Yes	Yes	Yes	No

Q24: Where are frequency and output power adjusted? (See page 7-5.)

The frequency tolerance is within ±3 ppm. There is no place for adjusting the frequency. If the frequency is out of range, replace the TX board.

Output is adjusted by TX board R133 with the output set to 12.5 W. There is no output adjustment for 2 W and 1 W.

Q25: How long is the AIS communication range?

Sight distance

Because radio wave propagated between two points in the VHF band is limited by the sight distance: Do, assuming the antenna height of the own ship to be 4 m: h1 and the antenna height of the other ship to be 25 m: h2,

Do km = 4.12 ($\sqrt{h1} + \sqrt{h1}$)

Do km = 4.12 ($\sqrt{4} + \sqrt{25}$) = 28.8 km = 15.6 NM,

and therefore, the sight distance is 28.8 km (15.6 NM).

Electric field intensity in the free space

The AIS transmission output is 12.5 W. Because the electric power fed to the antenna depends on the coaxial cable length, if this length is assumed to be 20 m, the loss is about 20 %. In addition, the radiation efficiency of antenna is assumed to be 100 %.

Consequently, the electric power fed to the antenna is given by:

12.5 W x 80 % = 10 W.

The antenna current: Ia that runs through the antenna is given by:

$Ia = \sqrt{10W/50\Omega} = 0.45$ A

The effective height of antenna: he is given by:

$he = \lambda / \pi$

where, λ: VHF wavelength ($3 \times 10^8/160$ MHz = 1.9 m)

$he = 1.9 / \pi = 0.6$ m.

In general, the electric field intensity: E (V/m) of a free space which is "d m" distant from the doublet antenna is calculated by the following equation. For example, the electric field intensity at the sight distance: 28.8 km is given by:

$E\ (V/m) = (60 \pi \times Ia \times he) / \lambda \times d$

where, Ia: antenna current (0.45 A)

he: effective height of antenna (0.6 m)

λ: VHF wavelength (1.9 m)

d: distance (28,800 m)

$E\ (V/m) = (60 \pi \times 0.45 \times 0.6)/1.9 \times 28{,}800 = 0.00093$

$E\ dB\mu V/m = 20 \log(0.00093/1 \times 10^{-6}) = 59.4\ dB\mu V/m$

In such event, the voltage induced in the antenna: E_{ant} is given by:

$E_{ant} = 59.4\ dB\mu V/m + 20 \log 0.6 = 55\ dB\mu V$

Minimum reception level of AIS device

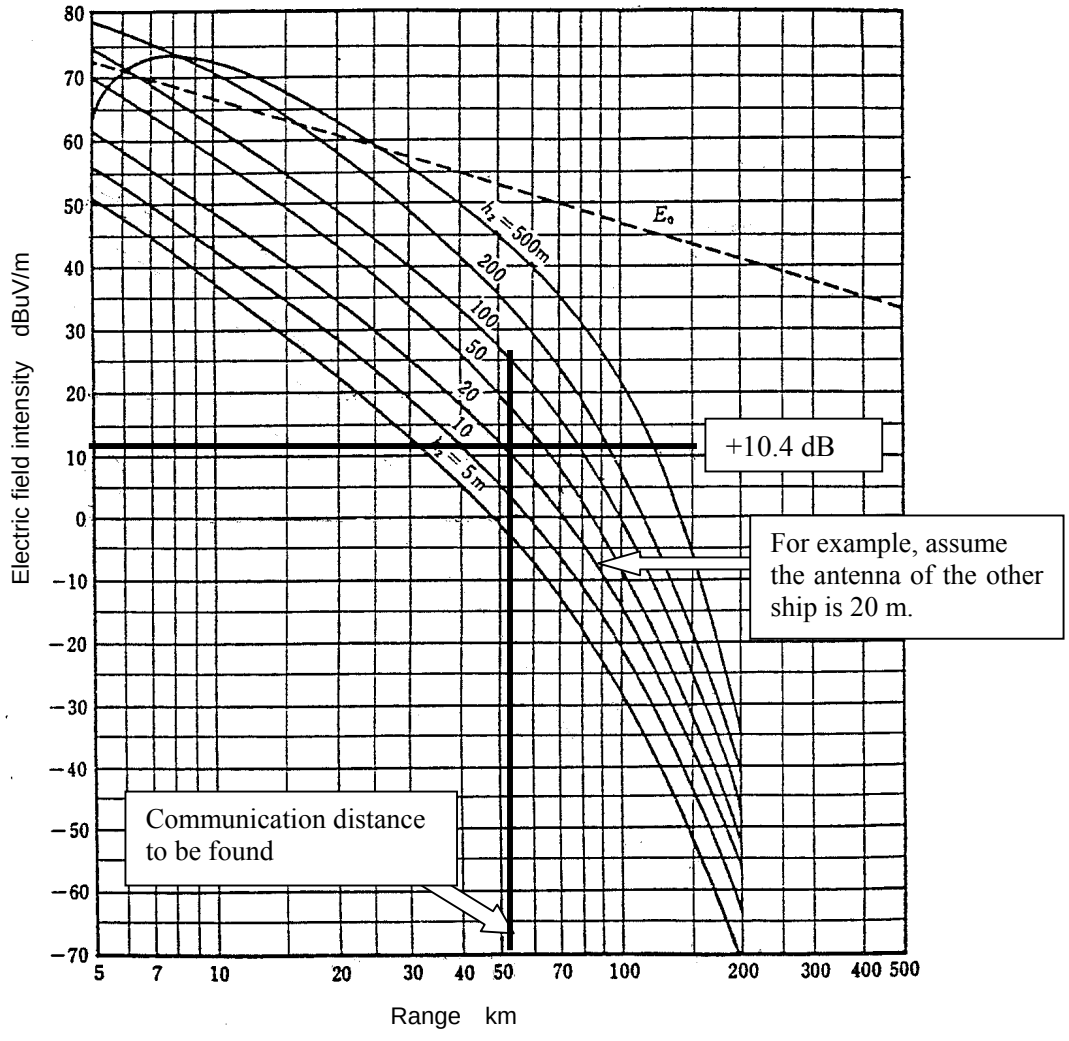
It is defined that the packet error rate is within 20 % at +6 dBμV (2μV).

Consequently, within the sight distance of 15.6 NM, radio waves can be satisfactorily received. When the distance is greater than this, radio waves are propagated by diffraction waves and radio waves are rapidly attenuated. The graph of the next page indicates that the communication distance to achieve +6 dBμV is 60 km (32 NM).

Reception distance calculation curve (h1 = 10 m; transmission output: 10 W)
The graph below is used to find the electric field intensity at h1: 10 m and h2, the antenna height of the other ship, with 144 MHz and 10 W antenna output.
To AIS, the 150 MHz band is assigned but it can be regarded to provide the same propagation characteristics of 144 MHz of the table below.

The method to find the reception distance:
Assume that the antenna of the own ship is 3 m and that of the other ship is 10 to 30 m. The intersection of the X-axis of the line of minimum electric field intensity: +10.4 dBμV/m: +6 dBμV-(20 log0.6) and the curve with the antenna height of the other ship, for example, 20 m assumed is the reception distance.

Consequently, from the graph, 50 - 70 km (26 - 38 NM) is the communication range of the VHF band and the communication of the distance exceeding it would be said abnormal propagation.



Appendix 1. Specifications

1. TRANSPONDER UNIT

1.1	TX/RX Frequency:	156.025 MHz to 162.025 MHz
1.2	Output Power:	1 W/ 2 W/ 12.5 W within ±1.5 dB, selectable
1.3	Impedance:	50 ohms
1.4	DSC Receiver:	CH70 fixed, 156.525 MHz, G2B, 1200 bps
1.5	Bandwidth:	25 kHz/ 12.5 kHz

2. MONITOR UNIT

2.1	Display:	4.5-inch, monochrome LCD
2.2	Display Size:	60 (H) x 95 (W) mm
2.3	No. of Dots:	120 x 64 dots

3. GPS RECEIVER

3.1	Receiving Channels:	12 channels parallel, 12 satellites tracking
3.2	Rx Frequency/ Rx Code:	1575.42 MHz, C/A code
3.3	Position Fixing System:	All in view, 8-state Kalman filter
3.4	Position Accuracy:	Approx. 10 m, 95 % of the time, (HDOP ≤ 4) DGPS: approx. less than 5 m, 95 % of the time
3.5	Tracking Velocity:	900 kts
3.6	Position-fixing Time:	Warm start: 36 seconds, Cold start: 43 seconds
3.7	Position Update Interval:	1 second
3.8	DGPS Data Receiving:	RTCM SC-104 Ver 2.1 formatted

4. INTERFACES

4.1	COM1 – COM4:	IEC 61162-1(2000-07) / 61162-2(1998-09)
	Input:	VSD, SSD, ABM, BBM, ACA, ACK, AIR, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, OSD, RMC, ROT, VBW, VTG
	Output:	VDM, VDO, ABK, ACA, ACS, ALR, TXT, LR1, LR2, LR3, LRF, LRI
		Note; COM4 also functions as SENSOR input.
4.2	SENSOR (input):	IEC 61162-1(2000-07) / 61162-2(1998-09)

4.3	COM4 – 6 (input):	DTM, GNS, GLL, GGA, RMC, VBW, VTG, OSD, HDT, GBS, ROT
4.4	External Beacon:	RS-232C (PC)
4.5	PC:	RS-232C
4.6	Alarm Output:	Contact closure
4.7	AD-10:	AD-10 format (FURUNO gyro format)

5. POWER SUPPLY

5.1 Monitor Unit: 12 - 24 VDC: 0.3 - 0.15 A

5.2 Transponder Unit: 12 - 24 VDC: 7 - 3.5 A

5.3 AC/DC Power Supply Unit: PR-240 (option)
100-115/200-230 VAC, 1 phase, 50/60 Hz

6. ENVIRONMENTAL CONDITION

6.1 Ambient Temperature
GPS Antenna Unit: -25 °C to +70 °C
Other Units: -15 °C to +55 °C

6.2 Relative Humidity 95 % at 40 °C

6.3 Waterproofing (IEC 60529)
Antenna Unit: IPX6
Other Units: IPX0

6.4 Vibration (IEC 60945 ed. 4)
From 2 Hz-5 Hz to 13.2 Hz: Amplitude ±1 mm ±10 %
(Maximum acceleration at 13.2 Hz: 7 m/s^2)

7. COATING COLOR

7.1 GPS Antenna Unit: N9.5

7.2 Other Units: 2.5GY5/1.5

Appendix 2. VHF Channel List

AP2.1 International mode

Ch No.	FREQ.	Ch No.	FREQ.	Ch No.	FREQ.	Ch No.	FREQ.
1001	156.05	1088	157.425	277	156.8875	2079	161.575
1002	*156.1*	1201	156.0625	1278	156.9375	2080	161.625
1003	156.15	1202	156.1125	1279	156.9875	2081	161.675
1004	*156.2*	1203	156.1625	1280	157.0375	2082	161.725
1005	156.25	1204	156.2125	1281	157.0875	2083	161.775
6	156.3	1205	156.2625	1282	157.1375	2084	161.825
1007	156.35	1206	156.3125	1283	157.1875	2085	161.875
1018	156.9	1207	156.3625	1284	157.2375	2086	161.925
1019	156.95	208	156.4125	1285	157.2875	2087	161.975
1020	157	209	156.4625	1286	157.3375	2088	162.025
1021	157.05	210	156.5125	1287	157.3875	2201	160.6625
1022	157.1	211	156.5625	2001	160.65	2202	160.7125
1023	157.15	212	156.6125	2002	160.7	2203	160.7625
1024	157.2	213	156.6625	2003	160.75	2204	160.8125
1025	157.25	214	156.7125	2004	160.8	2205	160.8625
1026	157.3	215	156.7625	2005	160.85	2206	160.9125
1027	157.35	216	156.8125	2007	160.95	2207	160.9625
1028	157.4	217	156.8625	8	156.4	2218	161.5125
1060	*156.025*	1218	156.9125	9	156.45	2219	161.5625
1061	156.075	1219	156.9625	10	156.5	2220	161.6125
1062	*156.125*	1220	157.0125	11	156.55	2221	161.6625
1063	156.175	1221	157.0625	12	156.6	2222	161.7125
1064	156.225	1222	157.1125	13	156.65	2223	161.7625
1065	156.275	1223	157.1625	14	156.7	2224	161.8125
1066	156.325	1224	157.2125	15	156.75	2225	161.8625
67	156.375	1225	157.2625	16	156.8	2226	161.9125
68	156.425	1226	157.3125	17	156.85	2227	161.9625
69	156.475	1227	157.3625	2018	161.5	2228	162.0125
70	156.525	1228	157.4125	2019	161.55	2260	160.6375
71	156.575	1260	156.0375	2020	161.6	2261	160.6875
72	156.625	1261	156.0875	2021	161.65	2262	160.7375
73	156.675	1262	156.1375	2022	161.7	2263	160.7875
74	156.725	1263	156.1875	2023	161.75	2264	160.8375
75	156.775	1264	156.2375	2024	161.8	2265	160.8875
76	156.825	1265	156.2875	2025	161.85	2266	160.9375
77	156.875	1266	156.3375	2026	161.9	2278	161.5375
1078	156.925	267	156.3875	2027	161.95	2279	161.5875
1079	156.975	268	156.4375	2028	162	2280	161.6375
1080	157.025	269	156.4875	2060	160.625	2281	161.6875
1081	157.075	270	156.5375	2061	160.675	2282	161.7375
1082	157.125	271	156.5875	2062	160.725	2283	161.7875
1083	157.175	272	156.6375	2063	160.775	2284	161.8375
1084	157.225	273	156.6875	2064	160.825	2285	161.8875
1085	157.275	274	156.7375	2065	160.875	2286	161.9375
1086	157.325	275	156.7875	2066	160.925	2287	161.9875
1087	157.375	276	156.8375	2078	161.525		

AP2.2 USA mode

Ch No.	FREQ.	Ch No.	FREQ.	Ch No.	FREQ.	Ch No.	FREQ.
1001	156.05	1088	157.425	277	156.8875	2079	161.575
		1201	156.0625	1278	156.9375	2080	161.625
1003	156.15	1202	156.1125	1279	156.9875	2081	161.675
		1203	156.1625	1280	157.0375	2082	161.725
1005	156.25	1204	156.2125	1281	157.0875	2083	161.775
6	156.3	1205	156.2625	1282	157.1375	2084	161.825
1007	156.35	1206	156.3125	1283	157.1875	2085	161.875
1018	156.9	1207	156.3625	1284	157.2375	2086	161.925
1019	156.95	208	156.4125	1285	157.2875	2087	161.975
1020	157	209	156.4625	1286	157.3375	2088	162.025
1021	157.05	210	156.5125	1287	157.3875	2201	160.6625
1022	157.1	211	156.5625	2001	160.65	2202	160.7125
1023	157.15	212	156.6125	2002	160.7	2203	160.7625
1024	157.2	213	156.6625	2003	160.75	2204	160.8125
1025	157.25	214	156.7125	2004	160.8	2205	160.8625
1026	157.3	215	156.7625	2005	160.85	2206	160.9125
1027	157.35	216	156.8125	2007	160.95	2207	160.9625
1028	157.4	217	156.8625	8	156.4	2218	161.5125
		1218	156.9125	9	156.45	2219	161.5625
1061	156.075	1219	156.9625	10	156.5	2220	161.6125
		1220	157.0125	11	156.55	2221	161.6625
1063	156.175	1221	157.0625	12	156.6	2222	161.7125
1064	156.225	1222	157.1125	13	156.65	2223	161.7625
1065	156.275	1223	157.1625	14	156.7	2224	161.8125
1066	156.325	1224	157.2125	15	156.75	2225	161.8625
67	156.375	1225	157.2625	16	156.8	2226	161.9125
68	156.425	1226	157.3125	17	156.85	2227	161.9625
69	156.475	1227	157.3625	2018	161.5	2228	162.0125
70	156.525	1228	157.4125	2019	161.55	2260	160.6375
71	156.575	1260	156.0375	2020	161.6	2261	160.6875
72	156.625	1261	156.0875	2021	161.65	2262	160.7375
73	156.675	1262	156.1375	2022	161.7	2263	160.7875
74	156.725	1263	156.1875	2023	161.75	2264	160.8375
75	156.775	1264	156.2375	2024	161.8	2265	160.8875
76	156.825	1265	156.2875	2025	161.85	2266	160.9375
77	156.875	1266	156.3375	2026	161.9	2278	161.5375
1078	156.925	267	156.3875	2027	161.95	2279	161.5875
1079	156.975	268	156.4375	2028	162	2280	161.6375
1080	157.025	269	156.4875	2060	160.625	2281	161.6875
1081	157.075	270	156.5375	2061	160.675	2282	161.7375
1082	157.125	271	156.5875	2062	160.725	2283	161.7875
1083	157.175	272	156.6375	2063	160.775	2284	161.8375
1084	157.225	273	156.6875	2064	160.825	2285	161.8875
1085	157.275	274	156.7375	2065	160.875	2286	161.9375
1086	157.325	275	156.7875	2066	160.925	2287	161.9875
1087	157.375	276	156.8375	2078	161.525		

1 W power on CH13 and CH67.

AP2.3 Channel Number Assignments

1. International AIS Channel
   - 2087: 161.975 MHz (AIS-1)
   - 2088: 162.025 MHz (AIS-2)

2. For channel number assignments to simplex operation of duplex channels:

Channel Number	Ship	Ship & Coast	Coast
For normal duplex operation: 60	156.025	-	160.625
For simplex operation of ship station frequency: 1060 (adding 1000)	-	156.025	-
For simplex operation of coast Stati on frequency: 2060 (adding 2000)	-	160.625	-

3. For channel number assignments to simplex channels, addition of 1000 is made to existing channel numbers.

4. For channel number assignments to narrowband operation (12.5 kHz) on 25 kHz channels:

Channel Number	Ship	Ship & Coast	Coast
For normal channel operation: 60	156.025	-	160.625
For 12.5 kHz operation on 25 kHz channel: 460 (adding 400)	156.025	-	160.625

AP3.1 Messages

AP3.1.1 Message types

All message types are described on the next page. The message table (Table AP3.1.1) uses the following columns:

- *Category*

  F: Functional Message
  S: System Management Message
  F/S: Functional Message and System Management Message

- *Priority*

  There are four levels of message priority, namely:

  Priority 1 (highest priority):
  Critical link management messages including position report messages in order to ensure the viability of the link;

  Priority 2 (highest service priority):
  Safety related messages. These messages are transmitted with a minimum of delay;

  Priority 3
  Assignment, interrogation and responses to interrogation messages;

  Priority 4 (lowest priority):
  All other messages.

- *Operation Mode*

  AU: Autonomous
  AS: Assigned
  IN: Interrogation/Polled

- *Access scheme*

  This column indicates how a station may select slots for transmission of this message.

- *Communication State (Comm. State)*

  Used in the message. If a message does not contain a Communication State, it is stated as “N/A(Not Applicable)”. Communication State where applicable indicates expected future use of that slot. If no Communication State is indicated, the slot is immediately available for future use.

- *Mobile/Base*

  Indicates the message transmitting station. Mobile means mobile station, and Base means base station.

Table AP3.1.1(a) Message summery -1

Message ID		Description	Category	Priority	Operation mode	Access scheme	Comm. state	Mobile/ Base
1	Position Report	Scheduled position report; (Class A shipborne Mobile Equipment)	F/S	1	Autonomous	SOTDMA RATDMA ITDMA(1)	SOTDMA	Mobile
2	Position Report	Assigned Scheduled position Report; (Class A shipborne Mobile Equipment)	F/S	1	Assigned	SOTDMA(9)	SOTDMA	Mobile
3	Position Report	Special position report, response to interrogation; (Class A shipborne Mobile Equipment)	F/S	1	Autonomous	RATDMA	ITDMA	Mobile
4	Base Station Report	Position, UTC, Date and current Slot number of Base station	F/S	1	Assigned(3) (7)	FATDMA RATDMA	SOTDMA	Base
5	Static and Voyage Related Data	Scheduled static and voyage related vessel data report; (Class A shipborne Mobile Equipment)	F	4(5)	Autonomous Assigned	RATDMA ITDMA(2)	Not Applicable	Mobile
6	Binary Addressed Message	Binary data for addressed communication	F	4	Autonomous Assigned Interrog./Polled	RATDMA(10) FATDMA ITDMA(2)	Not Applicable	Mobile/ Base
7	Binary Ack.	Ack. of received addressed binary data	S	1	Autonomous Assigned Interrog./Polled	RATDMA FATDMA ITDMA(2)	Not Applicable	Mobile /Base
8	Binary Broadcast Message	Binary data for broadcast communication	F	4	Autonomous Assigned Interrog./Polled	RATDMA(10) FATDMA ITDMA(2)	Not Applicable	Mobile/ Base
9	Standard SAR Aircraft Positiion Report	Position report for airborn stations involved in SAR operations, only	F/S	1	Autonomous Assigned	RATDMA FATDMA ITDMA(1)	SOTDMA ITDMA	Mobile
10	UTC/Date inquiry	Request UTC and date	F/S	3	Autonomous Assigned Interrog./Polled	RATDMA FATDMA ITDMA(2)	Not Applicable	Mobile/ Base
11	UTC/Date Response	Current UTC and date if available	F/S	3	Autonomous Assigned Interrog./Polled	RATDMA ITDMA(2)	SOTDMA	Mobile
12	Addressed Safety Related Message	Safety related data for addressed communication	F	2	Autonomous Assigned Interrog./Polled	RATDMA(10) FATDMA ITDMA(2)	Not Applicable	Mobile/ Base
13	Safety Related Ack.	Ack. of received addressed safety related message	S	1	Autonomous Assigned Interrog./Polled	RATDMA FATDMA ITDMA(2)	Not Applicable	Mobile/ Base
14	Safety Related broardcast Message	Safety related data for broadcast communication	F	2	Autonomous Assigned Interrog./Polled	RATDMA(10) FATDMA ITDMA(2)	Not Applicable	Mobile/ Base

Table AP3.1.1(b) Message summery -2

15	Inter-rogation	Request for a specific message Type; (can result in multiple responses from one or several stations)	F	3	Autonomous Assigned Interrog./Polled	RATDMA FATDMA ITDMA(2)	Not Applicable	Mobile/ Base
16	Assign-ment Mode Command	Assignment of a specific report behaviour by competent authority using a base station	F/S	1	Assigned	RATDMA FATDMA	Not Applicable	Base
17	DGNSS Broadcast Binary Message	DGNSS corrections provided by a base station	F	2	Assigned(3)	RATDMA FATDMA	Not Applicable	Base
18	Standard Class B Equipment Position report	Standard Position Report for Class B Shipborne Mobile Equipment to be used instead of Message 1,2,3.(8)	F/S	1	Autonomous Assigned	RATDMA ITDMA(1)	SOTDMA ITDMA	Mobile
19	Extended Class B Equipment Position Report	Extended Position Report for Class B Shipborn Mobile Equipment; contains additional static information.(8)	F/S	1	Autonomous Assigned	ITDMA	Not Applicable	Mobile
20	Data Link Manage-ment Message	Reserve slot for base station(s)	S	1	Assigned(3)	RATDMA FATDMA	Not Applicable	Base
21	Aids-to-Nav. Report	Position and Status Report for Aids-to- Nav.	F/S	1	Autonomous Assigned Interrog./Polled (3)	RATDMA FATDMA	Not Applicable	Mobile/ Base
22	Channel Manage-ment	Management of channels and transceiver modes by a base station	S	1	Assigned(3) (6)	RATDMA FATDMA	Not Applicable	Base

Note:

(1) ITDMA is used during the first frame phase and during a change of Report Rate (Rr). SOTDMA is used during the continuous operation phase. RATDMA can be used at any time to transmit additional position reports.

(2) This message type is broadcasted within 4 seconds. The RATDMA access scheme is the default method for allocating the slot(s) for this message type. Alternatively, an existing SOTDMA allocated slot can use the ITDMA access scheme for allocating the slot(s) for this message. A base station may use an existing FATDMA allocated slot for allocating the slot(s) for transmission of this message type.

(3) A base station is always operating in assigned mode using a fixed transmission schedule (FATDMA) for its periodic transmissions. The “Data Link Message” is used to announce the base station’s fixed allocation schedule. If necessary, either ITDMA or RATDMA may be used to transmit non- periodic broadcasts.

(4) For interrogation of UTC and date, message identifier 10 is used.

(5) Priority 3, if in response to interrogation.

(6) In order to satisfy the requirements for dual channel operation, the following applies, unless otherwise specified by Message 22:
   a) For periodic repeated messages, including the initial link access, the transmissions alternate between AIS1and AIS2.
   b) Transmissions following slot allocation announcements, responses to requests, and acknowledgements are transmitted on the same channel as the initial message.
   c) For addressed messages, transmissions utilize the channel in which a message from the addressed station was last received.
   d) For non-periodic messages other than those referenced above, the transmissions of each message, regardless of message type, alternate between AIS1 and AIS2.

(7) Recommendations for base stations (dual channel operations): Base stations alternate their transmissions between AIS 1 and AIS 2 for the following reasons:
   a) to increase link capacity;
   b) to balance channel loading between AIS 1 and AIS 2.
   c) to mitigate the harmful effects of RF interface.

(8)
   a) Equipment other than Class B Shipborne mobile does not transmit message 18 and 19.
   b) Class B Shipborne Mobile Equipment only uses Message 18 and 19 for position reporting and static data.

(9) When using reporting rate assignment by Message 16 the Access Scheme is SOTDMA. When using assignment of transmission slots by Message 16 the Access Scheme is assigned operation using SOTDMA Communication state.

(10) For Message 6, 8, 12 and 14 RATDMA transmissions from a mobile station does not exceed a total of 20 slots in a frame with a maximum of 5 consecutive slots per message.

AP3.1.2 Message Descriptions

This paragraph describes each message.

Message 1, 2, 3: Position Report

The position report is output periodically by mobile stations.

Table AP3.1.2 Message 1, 2, 3

Parameter	Number of bits	Description
Message ID	6	Identifier for this message 1, 2, or 3
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
User ID	30	MMIS number
Navigational status	4	Under way using engine, at anchor or not under command etc
ROT	8	Turning head speed (ROT data is not derived from COG information)
SOG	10	Speed over ground in 1/10 knot steps
Position accuracy	1	Indicating the accuracy within 10 m or not.
Longitude	28	Longitude In 1/10000 min
Latitude	27	Latitude in 1/10000 min
COG	12	Course over ground in 1/10º
True Heading	9	Degrees
Time stamp	6	UTC second when the report was generated by the EPFS mode, or 61 if positioning system is in manual input mode.
Reserved for regional applications	4	Reserved
Spare	1	Not used.
RAIM-flag	1	RAIM flag of Electronic Position Fixing Device
Communication State	19	
Total number of bits	168	

Message 4: Base station report, Message 11: UTC and Date response

This message is used for reporting UTC time and date and, at the same time, position. A base station uses Message 4 in its periodical transmissions. A mobile station outputs Message 11 only in response to interrogation by Message 10. Message 11 is only transmitted as a result of a UTC Request message (Message 10). The UTC and Data response is transmitted on the channel, where the UTC request message was received.

Table AP3.1.3 Message 4, 11

Parameter	Number of bits	Description
Message ID	6	Identifier for this message 4, 11
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
User ID	30	MMIS number
UTC year	14	Year
UTC month	4	Month
UTC day	5	Day
UTC hour	5	Time
UTC minute	6	Minute
UTC second	6	Second
Position accuracy	1	Indicating the accuracy within 10 m or not.
Longitude	28	Longitude In 1/10000 min
Latitude	27	Latitude In 1/10000 min
Type of Electronic Position Fixing Device	4	GPS, GLONASS, Loran-C etc
Spare	10	Not used.
RAIM-flag	1	RAIM flag of Electronic Position Fixing Device
Communication State	19	
Total number of bits	168	

Message 5: Ship Static and Voyage related data

This message is only used by Class A Shipborne Mobile Equipment when reporting static or voyage related data. It is transmitted immediately after any parameter value has been changed.

Table AP3.1.4 Message 5

Parameter	Number of bits	Description
Message ID	6	Identifier fir this message 5
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
User ID	30	MMIS number
AIS Version Indicator	2	Indicator for AIS Version
IMO number	30	IMO number
Call sign	42	7x6 bit ASCII characters
Name	120	Maximum 20 characters 6 bit ASCII
Type of ship and cargo type	8	Indicating the type of ship and cargo type
Overall Dimension/ Reference for position	30	Reference point for reported position; also indicates the dimension of ship in meters
Type of EPFS	4	GPS, GLONASS, Loran-C etc
ETA	20	Estimated Time of Arrival
Maximum Present Static draught	8	In 1/10 m
Destination	120	Maximum 20 characters using 6-bit ASCII
DTE	1	Data terminal ready
Spare	1	Not used.
Number of bits	424	Occupies 2 slots

Message 6: Addressed Binary Message

The Addressed Binary Message is variable in length, based on the amount of binary data. The length varies between 1 and 5 slots.

Table AP3.1.5 Message 6

Parameter	Number of bits	Description
Message ID	6	Identifier for Message 6
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMSI number OF source station
Sequence Number	2	Sequence Number
Destination ID	30	MMSI number of destination station
Retransmit Flag	1	Retransmit flag is set upon retransmission
Spare	1	Not used.
Binary Data	Max.936	Application Identifier (16 bit) and data (Max. 920 bits)
Maximum number of bits	Max.1008	

Message 7: Binary Acknowledge, Message 13: Safety Related Acknowledge

Message 7 is used as an acknowledgement of up to 4 Messages 6 and is transmitted on the same channel, that the addressed message to be acknowledged, was received.
Message 13 is used as an acknowledgement of up to 4 Messages 12 received, and is transmitted on the same channel, that the addressed message to be acknowledged was received.

Table AP3.1.6 Message 7, 13

Parameter	Number of bits	Description
Message ID	6	Identifier for message 7, 13
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMSI number oaf source of this ACK
Spare	2	Not used.
Destination ID 1	30	MMSI number of first destination of this ACK
Sequence number for ID 1	2	Sequence number of message to be acknowledged : 0-3.
Destination ID 2	30	MMSI number of second destination of this ACK
Sequence number for ID 2	2	Sequence number of message to be acknowledged : 0-3.
Destination ID 3	30	MMSI number of third destination of this ACK
Sequence number for ID 3	2	Sequence number of message to be acknowledged : 0-3.
Destination ID 4	30	MMSI number of fourth destination of this ACK
Sequence number for ID 4	2	Sequence number of message to be acknowledged : 0-3.
Total number of bits	72-168	

Message 8: Binary Broadcast Message

This message is variable in length and its size is based on the amount of binary data. The length varies between 1 and 5 slots.

Table AP3.1.7 Message 8

Parameter	Number of bits	Description
Message ID	6	Identifier for message 8
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMSI number of source station
Spare	2	Not used.
Binary Data	Max.968	Application Identifier (16 bit) and Application Data (Max.952 bits)
Total Number of bits	MAX.1008	Occupies 1 to 5 slots

Message 9: Standard SAR Aircraft Position Report

This message is used as a standard position report for aircraft involved in SAR operations instead of Message 1, 2, or 3. Stations other than aircraft involved in SAR operations do not transmit this message. The default reporting interval for this message is 10 seconds.

Table AP3.1.8 Message 9

Parameter	Number of bits	Description
Message ID	6	Identifier for message 9
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
User ID	30	MMIS number
Altitude (GNSS)	12	Altitude (derived from GNSS) expressed in meters (0-4094 m)
SOG	10	Speed over ground in knot steps (0-1022 knots)
Position accuracy	1	Indicating the accuracy within 10 m or not.
Longitude	28	Longitude in 1/10000 min
Latitude	27	Latitude in 1/10000 min
COG	12	Course over ground in 1/10º
Time stamp	6	UTC second when the report was generated by the EPFS mode, or 61 if positioning system is in manual input mode
Reserved for regional applications	8	Reserved for definition by a competent regional authority.
DTE	1	Data terminal ready
Spare	3	Not used.
Assigned Mode Flag	1	0= Station operating in autonomous and continuous mode 1= Station operating in assigned mode
RAIM-Flag	1	RAIM-Flag of Electronic Position Fixing Device.
Communication State Selector Flag	1	0= SOTDMA Communication State follows; 1= ITDMA Communication State follows.
Communication State	19	SOTDMA
Total number of bits	168	

Message 10: UTC and Date Inquiry

This message is used when a station is requesting UTC and data from another station.

Table AP3.1.9 Message 10

Parameter	Number of bits	Description
Message ID	6	Identifier for message 10
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMSI number of station which inquires UTC
Spare	2	Not used.
Destination ID	30	MMSI number of station which is inquired
Spare	2	Not used.
Total number of bits	72	

Message 12: Addressed Safety Related Message

The Addressed Safety Related Message could be variable in length, based on the amount of safety related text. The length varies between 1 and 5 slots.

Table AP3.1.10 Message 12

Parameter	Number of bits	Description
Message ID	6	Identifier for message 12
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMSI number of station which is the source of the message
Sequence Number	2	0-3
Destination ID	30	MMSI number of station which is the destination of the message
Retransmit Flag	1	Set upon retransmission.
Spare	1	Not used.
Safety related text	Max.936	6-bit ASCII
Total number of bits	Max. 1008	Occupies 1 to 5 slots subject to the length of text

Message 14: Safety Related Broadcast Message

The Safety Related Broadcast Message could be variable in length, base on the amount of safety related text. The length varies between 1 and 5 slots.

Table AP3.1.11 Message 14

Parameter	Number of bits	Description
Message ID	6	Identifier for message 14
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMSI number of source station of message
Spare	2	Not used.
Safety related Text	Max.968	6-bit ASCII
Total Number of bits	Max. 1008	

Message 15: Interrogation

The Interrogation Message is used for interrogations via the VHF TDMA link other than UTC and data requests. The response is transmitted on the channel that the interrogation was received on.

A Class A Shipborne Mobile Station can be interrogated for message identifiers 3 and 5, by another station. A Class B Shipborne Mobile Station can be interrogated for message identifiers 18 and 19, by another station. An airborne mobile station can be interrogated for message identifier 9 by another station. A mobile station mounted on an Aids-to-Navigation can be interrogated for message identifier 21 by another station. A base station can be interrogated for message identifiers 4, 17, 20 and 22.

Table AP3.1.12 Message 15

Parameter	Number of bits	Description
Message ID	6	Identifier for message 15
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMSI number of interrogating station
Spare	2	Not used.
Destination ID 1	30	MMSI number of first interrogated station
Message ID 1.1	6	First Requested message type from first interrogated station
Slot offset 1.1	12	Response slot offset for first requested message from first interrogated station
Spare	2	Not used.
Message ID 1.2	6	Second Requested message type from first interrogated station
Slot offset 1.2	12	Response slot offset for second requested message from first interrogated station
Spare	2	Not used.
Destination ID 2	30	MMSI number of second interrogated station
Message ID 2.1	6	Requested message type from second interrogated station
Slot offset 2.1	12	Response slot offset for requested message from second interrogated station
Spare	2	Not used.
Total number of bits	88-160	

Message 16: Assigned Mode Command

Assignment is transmitted by a base station when operating as a controlling entry.
When a Class A shipborne mobile AIS station receives an assignment, it reverts to either the assigned reporting rate or the resulting reporting rate (when slot assignment is used) or the autonomously derived reporting rate , whichever is higher.

Table AP3.1.13 Message 16

Parameter	Number of bits	Description
Message ID	6	Identifier for message 16
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMSI of assigning station.
Spare	2	Spare.
Destination ID A	30	MMSI number. Destination identifier A.
Offset A	12	Offset from current slot to first assigned slot.
Increment A	10	Increment to next assigned slot.
Destination ID B	30	MMSI number. Destination identifier B. It is omitted if there is assignment to station A, only.
Offset B	12	Offset from current slot to first assigned slot. It is omitted, if there is assignment to station A, only.
Increment B	10	Increment to next assigned slot. It is omitted, if there is assignment to station A, only.
Spare	Max.4	Spare.
Total	96 or 144	

Message 17: GNSS Broadcast Binary Message

This message is transmitted by a base station, which is connected to a DGNSS reference source, and configured to provide DGNSS data to receiving stations.

Table AP3.1.14 Message 17

Parameter	Number of bits	Description
Message ID	6	Identifier for message 17
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMSI of the base station.
Spare	2	Spare.
Longitude	18	Surveyed Longitude of DFNSS reference station in 1/10 min.
Latitude	17	Surveyed Latitude of DGNSS reference station in 1-10 min.
Spare	5	Not used.
Data	0-736	Differential Correction data.
Total number of bits	80-816	

Message 18: Standard Class B Equipment Position Report

The standard Class B Equipment Position report is output periodically and autonomously instead of Messages 1, 2, or 3 by Class B Shipborne Mobile Equipment, only.

Message 19: Extended Class B Equipment Position Report

This message is transmitted once every 6 minutes in two slots allocated by the use of Message 18 in the ITDMA Communication State.

Message 20: Data Link Management Message

This message is used by base station(s) to pre-announce the fixed allocation schedule (FATDMA) for one or more base station(s) and it is repeated as often as required.

Table AP3.1.15 Message 20

Parameter	Number of bits	Description
Message ID	6	Identifier for message 20
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMSI number of base station
Spare	2	Not used.
Offset number 1	12	Reserved offset number
Number of slots 1	4	Number of reserved consecutive slots
Time-out 1	3	Time-out value in minutes
Increment 1	11	Increment to repeat reservation block 1
Offset number 2	12	Reserved offset number (Optional)
Number of slots 2	4	Number of reserved consecutive slots (Optional)
Time-out 2	3	Time-out value in minutes (Optional)
Increment 2	11	Increment to repeat reservation block 2 (Optional)
Offset number 3	12	Reserved offset number (Optional)
Number of slots 3	4	Number of reserved consecutive slots (Optional)
Time-out 3	3	Time-out value in minutes (Optional)
Increment 3	11	Increment to repeat reservation block 3 (Optional)
Offset number 4	12	Reserved offset number (Optional)
Number of slots 4	4	Number of reserved consecutive slots (Optional)
Time-out 4	3	Time-out value in minutes (Optional)
Increment 4	11	Increment to repeat reservation block 4 (Optional)
Spare	Max 6	Not used.
Total number of bits	72-160	

Message 21: Aids to Navigation Report

This station may be mounted on an Aid-to Navigation or this message may be transmitted by a fixed station when the functionality of an A- to N station is integrated into the fixed station. This message is transmitted autonomously at a Reporting Rate of once every three minutes or it may be assigned by an Assigned Mode Command (Message 16) via the VHF data link, or by an external command.

Table AP3.1.16 Message 21

Parameter	Number of bits	Description
Message ID	6	Identifier for message 21
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMIS number
Type of Aid-to-Navigation	5	Fixing or floating type
Name of Aid-to-Navigation	120	Maximum 20 characters 6 bit ASCII
Position accuracy	1	Indicating the accuracy within 10 m or not.
Longitude	28	Longitude in 1/10000 min of position of Aid-to-Navigation
Latitude	27	Latitude in 1/10000 min of Aid-to-Navigation
Dimension/Reference for position	30	Reference point for reported position; also indicates the dimension of Aid-to-Navigation in meters, if relevant.
Type of Electronic position Fixing Device	4	GPS, GLONASS, Loran-C etc
Time Stamp	6	UTC second when the report was generated by the EPFS mode, or 61 if positioning system is in manual input mode.
Off-Position Indicator	1	For floating Aid-to-Navigation
Reserved for regional or local application	8	Reserved for definition by a competent regional or local authority.
RAIM-Flag	1	RAIM flag of Electronic Position Fixing Device
Virtual A to N Flag	1	0= default = real A to N at indicated position; 1= virtual A to N, does not physically exist, may only be transmitted from AIS station nearby.
Assigned Mode Flag	1	0= Station operating in autonomous and continuous mode=default 1= Station operating in assigned mode
Spare	1	Spare
Name of Aid-to-Navigation Extension	0,6,12,18, 24--84 Ed.1.3	This parameter of up to 14 additional 6-bit-ASCII characters for a 2-slot message may be combined with the parameter "Aid-to-Navigation" at the end of that parameter, when more than 20 characters are needed for the Name of Aid-to-Navigation. This parameter is omitted when no more than 20 characters for the name of A-to-N are needed in total. Only the required number of characters is transmitted.
Spare	0,2,4,6 Ed.1.3	
Number of bits	272-360 Ed.1.3	

Message 22: Channel Management

This message is transmitted by a base station (as a broadcast message) to command the VHF data link parameters for the geographical area designed in this message.

Table AP3.1.17 Message 22

Parameter	Number of bits	Description
Message ID	6	Identifier for message 22
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Station ID	30	MMSI number of base station
Spare	2	Not used.
Channel A	12	Channel number
Channel B	12	Channel number
TX/RX Mode	4	
Power	1	0= high, 1= low
Longitude 1	18	Longitude of area to which the assignment applies; upper right corner (north-east); in 1/10 min
Latitude 1	17	Latitude of area to which the assignment applies; upper right corner (north-east); in 1/10 min
Longitude 2	18	Longitude of area to which the assignment applies; lower left corner (south-west); in 1/10 min
Latitude 2	17	Longitude of area to which the assignment applies; lower left corner (south-west); in 1/10 min
Addressed or Broadcast Message Indicator	1	0= Broadcast Geographical Area Message =default, 1= Addressed message (to individual station(s))
Channel A bandwidth	1	Bandwidth
Channel B bandwidth	1	Bandwidth
Transitional Zone Size	3	The transitional Zone Size in nautical miles is calculated by adding 1 to this parameter value.
Spare	23	Not used.
Total number of bits	168	

Appendix 4. IEC-61162 sentence

AP4.1 Sentences used in FA-150

The sentences underlined are new IEC-61162 sentences due to AIS.

ABK	Addressed and binary broadcast acknowledgement
ABM	Addressed Binary and safety related Message
ACA	AIS Regional Channel Assignment Message
ACK	Acknowledgement alarm
AIR	AIS Interrogation Request
ALR	Set alarm state
BBM	Broadcast Binary Message
DTM	Datum reference
GBS	GNSS Satellite fault detection
GGA	Global positioning system fix data
GLL	Geographic position, latitude/longitude
GNS	GNSS fix data
HDT	Heading true
LRI	Long Range Interrogation
LRF	Long Range Function
LR1	Long Range Reply with destination for function request “A”
LR2	Long Range Reply with destination for function request “B, C, E and F”
LR3	Long Range Reply with destination for function request “I, O, P, U and W”
OSD	Own ship data
RMC	Recommended minimum specific GNSS data
ROT	Rate of turn
SSD	Ship Static Data
TXT	Text transmission
VBW	Dual ground/water speed
VDM	VHF Data Link Message
VDO	VHF Data Link Own-vessel message
VSD	Voyage Static Data
VTG	Course over ground and ground speed

AP4.2 IEC-61162 AIS sentences

The sentence underlined is new IEC-61162 sentences due to AIS.

ABK Addressed and binary broadcast acknowledgement

The ABK-sentence is generated when a transaction, initiated by reception of an ABM, AIR, or BBM sentence, is completed or terminated.

This sentence provides information about the success or failure of a requested ABM broadcast of either ITU-R M. 1371 messages 6 or 12. The ABK process utilizes the information received in ITU-R M. 1371 messages 7 and 13. Upon reception of either a VHF Data-link message 7 or 13, or the failure of messages 6 or 12, the AIS unit delivers the ABK sentence to the external application.

This sentence is also used to report to the external application the AIS unit's handling of the AIR (ITU-R M. 1371 message 15) and BBM (ITU-R M. 1371 message 8 and 14) sentences. The external application initiates an interrogation through the use of the use of the AIR-sentence, or a broadcast through the use of the BBM sentence. The AIS unit generates an ABK sentence to report the outcome of the AIR or BBM broadcast process.

$--ABK, xxxxxxxxx, a, x.x, x, x *hh<CR><LF>
a b c d e

a: MMSI of the addressed destination AIS unit

b: AIS channel of reception

c: ITU-R M.1371 message ID

d: Message Sequence Number

e: Type of acknowledgement

ABM Addressed Binary and safety related Message

This sentence supports ITU-R M. 1371 messages 6 and 12. It provides and external application with a means to exchange data using an AIS. The message data is defined by the application only - not the AIS. After receiving this sentence, the AIS initiates a radio broadcast on the VHF Data Link (VDL) of either message 6 or 12.

$--ABM, x, x, x, xxxxxxxxx, x, x.x, s--s, x*hh<CR><LF>
a b c d e f g h

a: Total number of sentences needed to transfer the message, 1 to 9
b: Sentence number, 1 to 9
c: Sequential Message identifier, 0 to 3
d: The MMSI of destination AIS unit for the ITU-R M.1371 message
e: AIS channel for broadcast of the radio message
f: ITU-R M.1371 message ID (6 or12)
g: Encapsulated data
h: Number of fill-bits, 0 to 5

ACA AIS Regional Channel Assignment Message

An AIS unit can receive regional channel management information four ways:
- ITU-R M. 1371 message 22
- DSC telecommand received on channel 70
- manual operator input, and
- an ACA-sentence.

The AIS unit may store channel management information for future use. Channel management information is applied based upon the actual location of the AIS unit. An AIS unit is “using” channel management information when the information is being used to manage the operation of the VHF receivers and/or transmitter inside the AIS unit. This sentence is used to both enter and obtain channel management information.

$--ACA, x, llll.ll, a, yyyyy.yy, a, llll.ll, a, yyyyy.yy, a, x,
a b c d e f
xxxx, x, xxxx, x, x, x, a, x, hhmmss.ss *hh<CR><LF>
g h i j k l m n o

a: Sequence Number, 0 to 9
b: Region Northeast corner latitude-N/S
c: Region Northeast corner longitude-E/W
d: Region Southwest corner latitude-N/S
e: Region Southwest corner longitude-E/W
f: Transition Zone Size (Value of 1 NM to a value of 8 NM)
g: Channel A
h: Channel A bandwidth

i: Channel B
j: Channel B bandwidth
k: TX/Rx mode control

Value	0	1	2	3	4	5
CHA	TX/RX	TX/RX	RX	RX	RX	Not used
CHB	TX/RX	RX	TX/RX	RX	Not used	RX

l: Power level control (12.5 W/2 W)

m: Information source

A: ITU-R M.1371 message 22 (Channel management address message)
B: ITU-R M.1371 message 22 (Channel management broadcast geographical area message)
C: IEC 61162-1 AIS channel assignment sentence
D: DSC channel 70 telecommand
M: Operator manual input

n: In-use flag

o: Time of “in-use” change

ACK Acknowledgement alarm

This sentence is used to acknowledge an alarm condition reported by device.

$--ACK, xxx *hh<CR><LF>
a

a: Local alarm number (identifier)

AIR AIS Interrogation Request

This sentence supports ITU-R M. 1371 message 15. It provides an external application with the means to initiate a request for specific ITU-R M. 1731 messages from distant mobile or base AIS stations.

$--AIR, xxxxxxxxx, x.x, x, x.x, x, xxxxxxxxx, x.x, x *hh<CR><LF>
a b c d e f g h

a: MMSI of interrogated station-1

b: ITU-R M.1371 message requested from station-1 note)

c: Massage sub-section (Reserved for future use)

d: Number of second message from station-1 note)

e: Massage sub-section (Reserved for future use)

f: MMIS interrogated station-2

g: Number of message requested from station-2note)

h: Massage sub-section (Reserved for future use)

Note) Example of messages that may be requested from a distant mobile AIS station include:

Message3: Position report
Message5: Ship static and voyage related data
Mesage9: Standard SAR aircraft position report
Message18: Standard class B equipment position report
Message19: Extended class B equipment position report
Message21: Aids-to-Navigation report

Example of messages that may be requested from a distant AIS base station include:

Message4: Base station report
Message17: GNSS broadcast binary message
Message20: Data link management message
Message22: Channel management

ALR Set alarm state

This sentence is used to report an alarm condition on a device and its current state of acknowledgement.

$--ALR, hhmmss.ss, xxx, A, A, c--c *hh<CR><LF>
a b c d e

a: Time of alarm condition change, UTC

b: Local alarm number (identifier) [identification number of alarm source]

c: Alarm condition (A= threshold exceeded, V=not exceeded)

d: Alarm's acknowledge state (A=acknowledged, V=unacknowledged)

e: Alarm's description text

BBM Broadcast Binary Message

This sentence supports generation of an ITU-R M. 1371 Binary Broadcast Message (message 8) or Safety Related Broadcast Message (message 14). After receiving this sentence, the AIS initiates a VHF broadcast of either message 8 or 14 within four seconds.

The success or failure if the broadcast confirmed through the use of the "Addressed and binary Broadcast Acknowledgement (ABK)" sentence formatter, and the processes that support the generation of an ABK-sentence. The AIS is limited in the amount of encapsulated data that can be sent in each slot and frame. If the length of the message would exceed five slots, or the AIS broadcast would exceed the limit of 20 RATDMA slot transmissions for the current frame, the AIS will return an ABK-sentence with an acknowledgement of "2" – message could not be broadcast.

$--BBM, x, x, x, x, x.x, s--s, x *hh<CR><LF>
a b c d e f g

a: Total number of sentences needed to transfer the message, 1 to 9

b: Sentence number, 1 to 9

c: Sequential message identifier, 0 to 9

d: AIS channel for broadcast of the radio message

e: ITU-R M.1371 message ID, 8 or 14

f: Encapsulated data
Binary data parameter for Message 8 or safety related text parameter for Message 14.

g: Number of fill-bits, 0 to 5

DTM Datum reference

Local geodetic datum and datum offsets from a reference datum. This sentence is used to define the datum to which a position location, and geographic locations in subsequent sentences, are referenced. Latitude, longitude and altitude offsets from the reference datum, and the selection of the reference datum, are also provided.

$--DTM, ccc, a, x.x, a, x.x, a, x.x, ccc *hh<CR><LF>
a b c d e f

a: Local datum
- WGS84=W84
- WGS72=W72
- SGS85=S85,
- PE90=P90
- User define=999
- IHO datum code

b: Local datum subdivision code

c: Lat offset, min, N/S

d: Lon offset, min, E/W

e: Altitude offset, m

f: Reference datum
- WGS84=W84
- WGS72=W72
- SGS85=S85
- PE90=P90

GBS GNSS Satellite fault detection

This message is used to support receiver autonomous integrity monitoring (RAIM).

$--GBS, hhmmss.ss, x.x, x.x, x.x, xx, x.x, x.x, x.x *hh<CR><LF>
a b c d e f g h

a: UTC time of the GGA or GNS fix associated with this sentence

b: Expected error in latitude

c: Expected error in longitude

b: Expected error in altitude

e: ID number of most likely failed satellite

f: Probability of missed detection for most likely failed satellite

g: Estimate of bias on most likely failed satellite

h: Standard deviation of bias estimate

GGA Global positioning system fix data

Time, position and fix-related data for a GPS receiver.

$--GGA, hhmmss.ss, llll.ll, a, yyyyy.yy, a, , x,
a b c d
xx, x.x, x.x, M, x.x, M, x.x, xxxx *hh<CR><LF>
e f g h i j k l

a: UTC of position

b: Latitude, N/S

c: Longitude, E/W

d: GPS quality indicator
0=Fix not available or invalid,
1=GPS SPS mode, fix valid,
2=Differential GPS, SPS mode, fix valid,
3=GPS PPS mode ,fix valid,
4=Real Time kinematic. Satellite system used in RTK mode with fixed integers
5=Float RTK. Satellite system used in RTK mode with floating integers,
6=Dead reckoning mode,
7=Manual input mode,
8=Simulator mode

e: Number of satellites in use, 00-12, may be different from the number in view

f: Horizontal dilution of precision

g: Antenna altitude above/below mean sea level (geoid)

h: Units of antenna altitude, m

i: Geoidal separation (difference between the WGC-84)

j: Units of geoidal separation, m

k: Age of differential GPS data

l: Differential reference station ID, 0000-1023

GLL Geographic position, latitude/longitude

Latitude and longitude of vessel position, time of position fix and status.

$--GLL, llll.ll, a, yyyyy.yy, a, hhmmss.ss, A, a *hh<CR><LF>
a b c d e

a: Latitude, N/S

b: Longitude, E/W

c: UTC of position

d: Status

A=data valid, V=data invalid

e: Mode indicator

A=Autonomous, M=Manual input, E=Dead reckoning
D=differential, S=Simulator, N=Data not valid

GNS GNSS fix data

Fix data for single or combined satellite navigation systems (GNSS).

$--GNS, hhmmss.ss, llll.ll, a, yyyyy.yy, a, , c--c,
a b c d
xx, x.x, x.x, x.x, x.x, x.x *hh<CR><LF>
e f g h i j

a: UTC of position

b: Latitude, N/S

c: Longitude, E/W

d: Mode indicator 1st char.=GPS, 2nd=GLONASS, 3rd=other satellite system

N=No fix	F=Float RTK
A=Autonomous	E=Dead reckoning mode
D=Differential	M=Manual input mode
P=Precise	S=Simulator mode
R=Real time Kinematic	

e: Total number of satellites in use, 00-99

f: HDOP

g: Antenna altitude, m, re: mean-sea-level(geoid)

h: Geoidal separation, m

i: Age of differential data

j: Differential reference station ID

HDT Heading true

Actual vessel heading in degrees true produced by any device or system producing true heading.

$--HDT, x.x, T *hh<CR><LF>
a

a: Heading, degree true

LRI Long Range Interrogation

The long-range interrogation of the AIS is accomplished through the use of two sentences. The pair of interrogation sentences, a LRI-sentence followed by a LRF-sentence, provides the information needed by an AIS to determine if it must construct and provide the reply sentences (LRF, LR1, LR2, and LR3).

$--LRI, x, a, xxxxxxxxx, xxxxxxxxx, llll.ll, a, yyyyy.yy, a,
a b c d e f
llll.ll, a, yyyyy.yy, a *hh<CR><LF>
g h

a: Sequence number, 0 to 9

b: Control flag

c: MMSI of requester

d: MMSI of destination

e: Latitude-N/S (north-east co-ordinate)[note)]

f: Longitude-E/W (north-east co-ordinate) [note)]

g: Latitude-N/S (south-west co-ordinate) [note)]

h: Longitude-E/W (south-west co-ordinate) [note)]

Note) The geographic region being interrogated is a rectangular area defined by the L/L of the north east and south west corners.

LRF Long Range Function

This sentence is used in both long-range interrogation requests and long-range interrogation replies. The LRF-sentence is the second sentence of the long-range interrogation request pair, LRI and LRF.
The LRF-sentence is also the first sentence of the long-range interrogation reply.
The minimum reply consists of a LRF-sentence followed by a LR1-sentence.
The LR2-sentence and/or the LR3-sentence follow the LR1-sentence, if information provided in these sentences.

$--LRF, x, xxxxxxxxx, c--c, c--c, c--c *hh<CR><LF>
a b c d e

a: Sequence number, 0 to 9

b: MMIS of requester

c: Name of requester, 1 to 20 character string

d: Function request, 1 to 26 characters

A=Ship's: name, callsign, and IMO number
B=Date and time of message composition
C=Position
E=COG (Course over ground)
F=SOG (Speed over ground)
I=ETA (Destination and Estimated Time of Arrival)
O=Draught
P=Ship/Cargo
U=Ship's: length, breadth, type
W=Persons on board

e: Function reply status

LR1 Long Range Reply with destination for function request "A"

The LR1-sentence identifies the destination for the reply and contains the information requested by the "A" function identification character (See the LRF-sentence).

$--LR1, x, xxxxxxxxx, xxxxxxxxx, c--c, c--c, xxxxxxxx *hh<CR><LF>
a b c d e f

a: Sequence number, 0 to 9
b: MMIS of responder
c: MMIS of requester (reply destination)
d: Ship's name, 1 to 20 characters
e: Call Sign, 1 to 7 characters
f: IMO number, 9 digit number

LR2 Long Range Reply for function requests "B, C, E and F"

The LR2-sentence contains the information requested by the "B, C, E and F" function identification characters (See the LRF-sentence).

$--LR2, x, xxxxxxxxx, xxxxxxxxx, hhmmss.ss, llll.ll, a,
a b c d e
yyyyy.yy, a, x.x, T, x.x, N *hh<CR><LF>
f g h

a: Sequence number, 0 to 9
b: MMIS of responder
c: Date: ddmmyyyy, 8 digits
d: UTC time of position
e: Latitude, N/S (position co-ordinate, to 1 min.)
f: Longitude, E/W (position co-ordinate, to 1 min.)
g: Course over ground true, value to nearest degree
h: Speed over ground, value to 0.1 knot

LR3 Long Range Reply for function requests “I, O, P, U and W”

The LR3-sentence contains the information requested by the “I, O, P, U and W” function identification characters (See the LRF-sentence).

$--LR3, x, xxxxxxxxx, c--c, xxxxxx, hhmmss.ss, x.x, cc,
a b c d e f g
x.x, x.x, x.x, x.x *hh<CR><LF>
h i j k

a: Sequence number, 0 to 9
b: MMIS of responder
c: Voyage destination, 1 to 20 characters
d: ETA Date: ddmmyy
e: ETA Time, value to nearest second
f: Draught, value to 0.1 meter
g: Ship/Cargo
h: Ship length, value to nearest meter
i: Ships breadth, value to nearest meter
j: Ship type
k: Persons, 0 to 8191

OSD Own ship data

Heading, course, speed, set and drift summary.

$--OSD, x.x, A, x.x, a, x.x, a, x.x, x.x, a *hh<CR><LF>
a b c d e f g h i

a: Heading, degrees true
b: Heading status A=data valid, V=data invalid
c: Vessel course, degrees true
d: Course reference, B/M/W/R/P
B=bottom tracking log M=manually entered
W=water referenced R=radar tracking (of fixed target)
P=positioning system ground reference
e: Vessel speed
f: Speed reference, B/M/W/R/P
g: Vessel set, degrees true
h: Vessel drift (speed)
i: Speed unit (km/h, Knots, miles/h)

RMC Recommended minimum specific GNSS data

Time, date, position, course and speed data provided by a GNSS navigation receiver.

$--RMC, hhmmss.ss, A, llll.ll, a, yyyyy.yy, a, x.x,
a b c d e
x.x, xxxxxx, x.x, a, a *hh<CR><LF>
f g h i

a: UTC of position fix
b: Status (A=data valid, V=navigation receiver warning)
c: Latitude, N/S
d: Longitude, E/W
e: Speed over ground, knots
f: Course over ground, degrees true
g: Date: dd/mm/yy
h: Magnetic variation, degrees, E/W
i: Mode indicator

A=Autonomous mode	M=Manual input mode
D=Differential mode	S=Simulator mode
E=dead reckoning mode	N=Data not valid

ROT Rate of turn

Rate of turn and direction of turn.

$--ROT, x.x, A *hh<CR><LF>
a b

a: Rate of turn, deg./min, "-"=bow turns to port
b: Status (A=data valid, V=data invalid)

SSD Ship Static Data

This sentence is used to enter static parameters into a shipboard AIS.

$--SSD, c--c, c--c, xxx, xxx, xx, xx, c, aa *hh<CR><LF>
a b c d e f g h

a: Ship's Call Sign, 1 to 7 characters

b: Ship's name, 1 to 20 characters

c: Pos. ref., "A", distance from bow, 0 to 511 meters

d: Pos. ref., "B", distance from stern, 0 to 511 meters

e: Pos. ref., "C", distance from port beam, 0 to 63 meters

f: Pos. ref., "D", distance from starboard beam, 0 to 63 meters

g: DTE indicator flag

0=Keyboard and display are a standard configuration, and communication is supported.

1=Keyboard and display are either unknown or unable to support communication.

h: Source identifier

TXT Text transmission

For the transmission of short text messages. Longer text messages may be transmitted by using multiple sentences.

$--TXT, xx, xx, xx, c--c *hh<CR><LF>
a b c d

a: Total number of messages, 01 to 99

b: Message number, 01 to 99

c: Text identifier

d: Text message

VBW Dual ground/water speed

Water-referenced and ground-referenced speed data.

$--VBW, x.x, x.x, A, x.x, x.x, A, x.x, A, x.x, A *hh<CR><LF>
a b c d e f g h i j

a: Longitudinal water speed, knots
b: Transverse water speed, knots
c: Status: water speed (A=data valid, V=data invalid)
d: Longitudinal ground speed, knots
e: Transverse ground speed, knots
f: Status: ground speed (A=data valid, V=data invalid)
g: Stern transverse water speed, knots
h: Status: stern water speed (A=data valid, V=data invalid)
i: Stern transverse ground speed, knots
j: Status: stern ground speed (A=data valid, V=data invalid)

VDM VHF Data Link Message

This sentence is used to transfer the entire contents of a received AIS message packet, as defined in ITU-R M. 1371 and as received on the VHF Data Link (VDL), using the "6-bit" field type. The structure provides for the transfer of long binary messages by using multiple sentences.

$--VDM, x, x, x, a, s—s, x *hh<CR><LF>
a b c d e f

a: Total number of sentences needed to transfer the message, 1 to 9
b: Sentence number, 1 to 9
c: Sequential message identifier, 0 to 9
d: AIS Channel, "A" or "B"
e: Encapsulated ITU-R M.1371 radio message
f: Number of fill-bits, 0 to 5

VDO VHF Data Link Own-vessel message

This sentence is used to provide the information assembled for broadcast by the AIS. It uses the six-bit field type for encapsulation. The sentence uses the same structure as the VDM sentence formatter.

$--VDO, x, x, x, a, s—s, x *hh<CR><LF>
a b c d e f

a: Total number of sentences needed to transfer the message, 1 to 9

b: Sentence number, 1 to 9

c: Sequential message identifier, 0 to 9

d: AIS Channel, “A” or “B”

e: Encapsulated ITU-R M.1371 radio message

f: Number of fill-bits, 0 to 5

VSD Voyage Static Data

This sentence is used to enter information about a ship’s voyage. This information remains relatively static during the voyage.

$--VSD, x.x, x.x, x.x, c--c, hhmmss.ss, xx, xx, x.x, x.x *hh<CR><LF>
a b c d e f g h i

a: Type of ship and cargo category, 0 to 255

b: Maximum present static draught, 0 to 25.5 meter

c: Persons on-board, 0 to 8191

d: Destination, 1-20 characters

e: Est. UTC of destination arrival

f: Est. day of arrival at destination, 00 to 31 (UTC)

g: Est. month of arrival at destination, 00 to 12 (UTC)

h: Navigational status, 0 to 15

ex) 0=under way using engine
1=at anchor
2=not under command, etc.

i: Regional application flags, 0 to 15

VTG Course over ground and ground speed

The actual course and speed relative to the ground.

$--VTG, x.x, T, x.x, M, x.x, N, x.x, K, a *hh<CR><LF>
a b c d e

a: Curse over ground, degrees true

b: Curse over ground, degrees magnetic

c: Speed over ground, knot

d: Speed over ground, km/m

e: Mode indicator

A=Autonomous mode	M=Manual input mode
D=Differential mode	S=Simulator mode
E=Dead reckoning mode	N=Data not valid

AP4.3 New serial sentences overview

The serial digital interface of the AIS is supported by a combination of existing and new IEC 61162 sentences. The table below summarizes the AIS messages use which use new sentences.

Table AP4.3.1(a)

Serial output sentence related to received VHF data link (VDL) messages			
AIS message		**Contents**	**Sentence**
MSG.1	Position Report	AIS target display information	VDM
MSG.2	Position Report		
MSG.3	Position Report		
MSG.9	Standard SAR Aircraft Position Report		
MSG.18	Standard Class B Equipment Position Report		
MSG.21	Aids to Navigation Report		
MSG.4	Base Station Report		
MSG.5	Static and Voyage Related Data		
MSG.19	Extended Class B Equipment Position Report		
MSG.12	Addressed Safety Related Message	Safety message handling	
MSG.14	Safety Related broadcast Message		
MSG.6	Binary Addressed Message	External Application handling	
MSG.8	Binary broadcast Message		
MSG.7	Binary Acknowledgement	System control	
MSG.10	UTC/Date inquiry		
MSG.11	UTC/Date Response		
MSG.13	Safety Relate Acknowledgement		
MSG.15	Interrogation		
MSG.16	Assignment Mode Command		
MSG.17	DGNSS Broadcast Binary Message		
MSG.20	Data Link Management Message		
MSG.22	Channel Management		
Serial output sentence related to broadcast VHF data link messages			
AIS message		**Contents**	**Sentence**
MSG.1	Position Report	VHF Data Link messages broadcast by AIS	VDO
MSG.2	Position Report		
MSG.3	Position Report		
MSG.5	Static and Voyage Related Data		
MSG.6	Binary Addressed Message		
MSG.7	Binary Acknowledgement		
MSG.8	Binary broadcast Message		
MSG.10	UTC/Date inquiry		
MSG.11	UTC/Date Response		
MSG.12	Addressed Safety Related Message		
MSG.13	Safety Relate Acknowledgement		
MSG.14	Safety Related broadcast Message		
MSG.15	Interrogation		
-		Addressed binary Acknowledgement	ABK

Table AP4.3.3.1(b)

Serial output sentence not directly related to VHF data link messages			
AIS message		**Contents**	**Sentence**
-		Long Range interrogation	LRI
-		Long Range interrogation	LRF
-		Long Range response	LR1
-		Long Range response	LR2
-		Long Range response	LR3
-		Regional channel management information	ACA
-		Alarm status (existing)	ALR
-		Alarm status (existing)	TXT
Serial input sentence directly related to VHF data link messages			
AIS message		**Contents**	**Sentence**
MSG.5	Ship and voyage related data	Static and Voyage Related Data	SSD
MSG.5	Ship and voyage related data	Static and Voyage Related Data	VSD
MSG.6	addressed binary	Binary Addressed Message	ABM
MSG.8	broadcast binary	Binary broadcast Message	BBM
MSG.12	Addressed safety related	Addressed Safety Related Message	ABM
MSG.14	broadcast safety related	Safety Related broadcast Message	BBM
MSG.15	AIS interrogation request	Interrogation	AIR
Serial input sentence not directly related to VHF data link messages			
AIS message		**Contents**	**Sentence**
-		channel assignment	ACA
-		AIS alarm ack (existing)	ACK
-		Long Range interrogation	LRI
-		Long Range interrogation	LRF

AP4.4 6-bit binary field type code conversion table

The construction of VDO and VDM sentences is shown as follows;

$--VDM (VDO), x, x, x, a, **s—s**, x *hh<CR><LF>

The “s-s” portion is stipulated as “encapsulated ITU-R M. 1371 radio message.”
For example, in the case of MSG. 1, the sentence is composed with a total of 168 bits that cover message ID: 6 bits to communication status: 16 bits.
The “s-s” portion is obtained by dividing 168 bits by every 6 bits from the head and converted into codes. For the PC display, this code is further converted into ASCII code.

The construction of ABM and BBM sentences is shown as follows;

$--ABM, x, x, x, xxxxxxxxx, x, x.x, **s--s**, x*hh<CR><LF>
$--BBM, x, x, x, x, x.x, **s--s**, x *hh<CR><LF>

The “s--s” portion is stipulated as “encapsulated ITU-R M. 1371 radio message.”
For example, in the case of MSG. 6, up to 936 bits only of binary data is divided by every 6 bits from the head and converted into codes. For the PC display, this code is further converted into ASCII code.

Table AP4.4.1 Six-bit binary field type code conversion table

Valid Character	Binary Field Represented	Valid Character	Binary Field Represented	Valid Character	Binary Field Represented
0 (30)	000000	F (46)	010110	d (64)	101100
1 (31)	000001	G (47)	010111	e (65)	101101
2 (32)	000010	H (48)	011000	f (66)	101110
3 (33)	000011	I (49)	011001	g (67)	101111
4 (34)	000100	J (4A)	011010	h (68)	110000
5 (35)	000101	K (4B)	011011	i (69)	110001
6 (36)	000110	L (4C)	011100	j (6A)	110010
7 (37)	000111	M (4D)	011101	k (6B)	110011
8 (38)	001000	N (4E)	011110	l (6C)	110100
9 (39)	001001	O (4F)	011111	m (6D)	110101
: (3A)	001010	P (50)	100000	n (6E)	110110
; (3B)	001011	Q (51)	100001	o (6F)	110111
< (3C)	001100	R (52)	100010	p (70)	111000
= (3D)	001101	S (53)	100011	q (71)	111001
> (3E)	001110	T (54)	100100	r (72)	111010
? (3F)	001111	U (55)	100101	s (73)	111011
@ (40)	010000	V (56)	100110	t (74)	111100
A (41)	010001	W (57)	100111	u (75)	111101
B (42)	010010	‘ (60)	101000	v (76)	111110
C (43)	010011	a (61)	101001	w (77)	111111
D (44)	010100	b (62)	101010		
E (45)	010101	c (63)	101011		

Note:
The code in parentheses of Valid Character column is the code obtained by converting Valid Character into 7-bit ASCII.

7-bit ASCII code table

ASCII is a 7-bit code, representing 128 different characters expressed by 0000000-1111111 (binary), which are converted into character codes 0x00 - 0x7F (hexadecimal numeral) using the following table.

Table AP4.4.2 Seven-bit ASCII code table

		b7, b6, b5							
		0	1	2	3	4	5	6	7
b4 b3 b2 b1	0	NUL	DLE	SP	0	@	P	`	p
	1	SOH	DC1	!	1	A	Q	a	q
	2	STX	DC2	"	2	B	R	b	r
	3	ETX	DC3	#	3	C	S	c	s
	4	EOT	DC4	$	4	D	T	d	t
	5	ENQ	NAC	%	5	E	U	e	u
	6	ACK	SYN	&	6	F	V	f	v
	7	BEL	ETB	'	7	G	W	g	w
	8	BS	CAN	(	8	H	X	h	x
	9	HT	EM	)	9	I	Y	i	y
	A	LF/NL	SUB	*	:	J	Z	j	z
	B	VT	ESC	+	;	K	[	k	{
	C	FF	FS	,	<	L	¥	l	|
	D	CR	GS	-	=	M	]	m	}
	E	SO	RS	.	>	N	^	n	~
	F	SI	US	/	?	O	_	o	DEL

AP4.5 PFEC I/O Table when Hi Level (NAVNET 2) is set

1. Conditions to select targets
   $PFEC,AItsc ,a ,a ,x ,x.x ,x.x ,x.x ,x.x *hh<CR><LF>

2. Range and bearing of target as well as CPA and TCPA information
   $PFEC,AIttm ,x ,xxxx ,xxxxxxxxx ,x.x ,x.x ,x.x ,x.x ,a ,A ,A ,A *hh<CR><LF>

3. Notifying the target to be changed
   $PFEC,AIcht ,a ,xxxxxxxxx ,xxxxxxxxx *hh<CR><LF>

4. Alarm setting-1
   $PFEC,AIal1 ,a ,a ,x.x ,x.x *hh<CR><LF>

5. Alarm setting-2
   $PFEC,AIal2 ,a ,a ,x.x *hh<CR><LF>

6. Alarm setting-3
   $PFEC,AIal3 ,a ,a ,x.x ,x.x ,x.x ,x.x *hh<CR><LF>

7. Kind of alarms generated
   $PFEC,AIalt ,A ,A ,A ,A ,A *hh<CR><LF>

8. Setting the handling method to the text message
   $PFEC,AIsmm ,a ,a *hh<CR><LF>

9. Request for received message
   $PFEC,AIrqm ,a ,a ,xxxx *hh<CR><LF>

10. Transmission of received message log
    $PFEC,AIrml ,x ,x ,xxxx ,hhmmss ,xx ,xx ,xxxx ,aa ,a *hh<CR><LF>

11. Test results
    $PFEC,AItrs ,ccccccc-cc.cc ,a ,a ,a *hh<CR><LF>

12. Stop of VDO sentence
    $PFEC,AIvdc ,a ,a *hh<CR><LF>

13. Notification of message reception
    $PFEC,AIrxm ,a ,xxxx ,aa *hh<CR><LF>

14. Alarm response
    $PFEC,AIack ,a ,a ,a *hh<CR><LF>

15. VDM stop command to control unit
    $PFEC,AIidm ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a ,a *hh<CR><LF>

16. Lost-approved target
    $PFEC,AIlst ,a ,xxxxxxxxx *hh<CR><LF>

17. Functions related to port attributes
    $PFEC,idatr ,A ,x *hh<CR><LF>

18. Command for function recognition and communication trouble detection

    $PFEC,idfnc ,a ,x.x *hh<CR><LF>

The installation procedure of the FAISPC MARK2 program is described on the FAISPC MARK2 operation manual.

AP5.1 Connection to PC port

AP5.1.1 Connection to PC

Connect PC to the FA-150 as follows. Use a 9-pin D-SUB **straight** cable between the FA-150 PC port and PC. DTR, CTS, and other control signals are NOT used. The required signals are RXD, TXD, and GND.

Note:

Control signals are connected between #4:DTR and #6:DSR, #7:RTS and #8:CTS in the MAIN board.

9 Pin D-sub	PC	FA-1501 [PC] port
1	DCD	N.C
2	RXD	PC SD
3	TXD	PC RD
4	DTR	DTR
5	GND	0V
6	DSR	DSR
7	RTS	RTS
8	CTS	CTS
9	RI	N.C
Frame	Shield	Shield

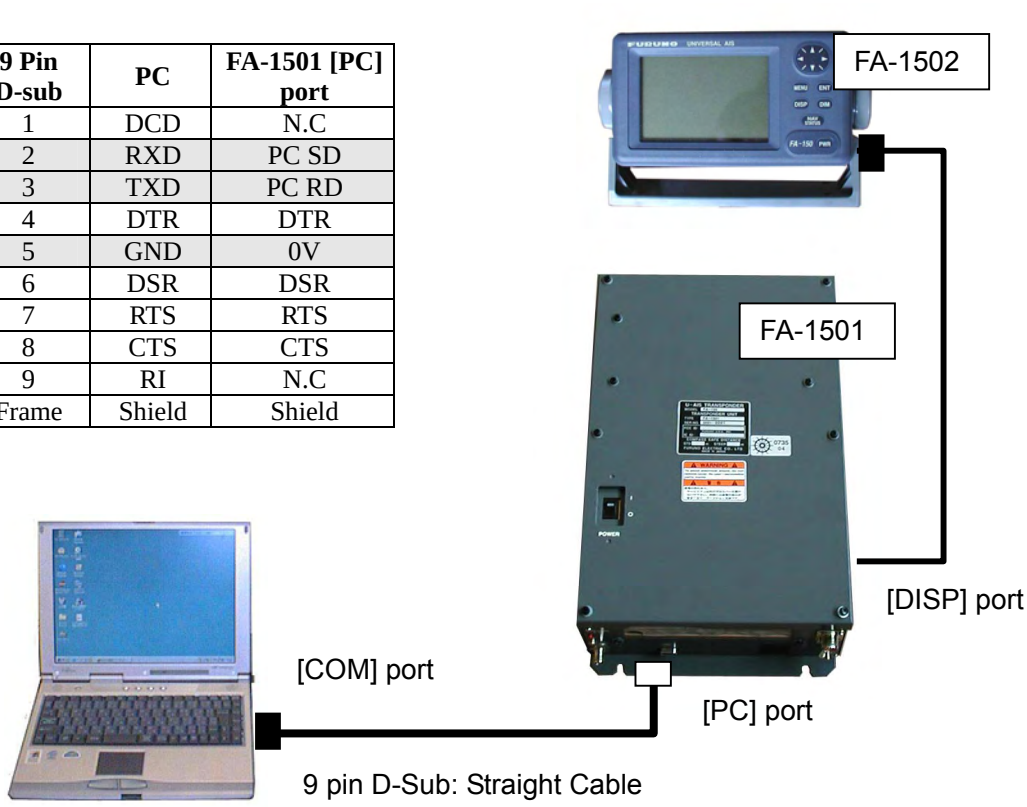


Fig. AP5.1.1 Connection to PC

AP5.1.2 Setting

1. Setting of PC port of FA-1501

1. Choose [MENU] -> INITIAL SETTINGS -> SET I/O PORT -> SET PC PORT.

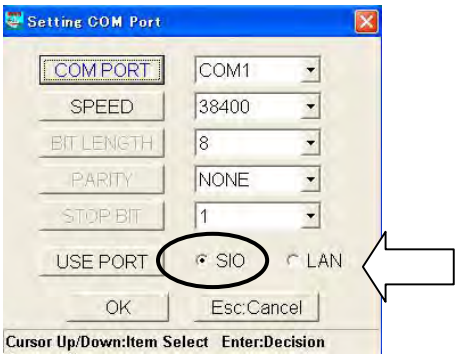
2. Set MODE of SET PC PORT to “MONITOR” and SPEED to “38.4 KBPS.”

```
[SET PC PORT]
MODE      : MONITOR
SPEED     : 38.4KBPS
```

2. Setting of FAISPC MARK2

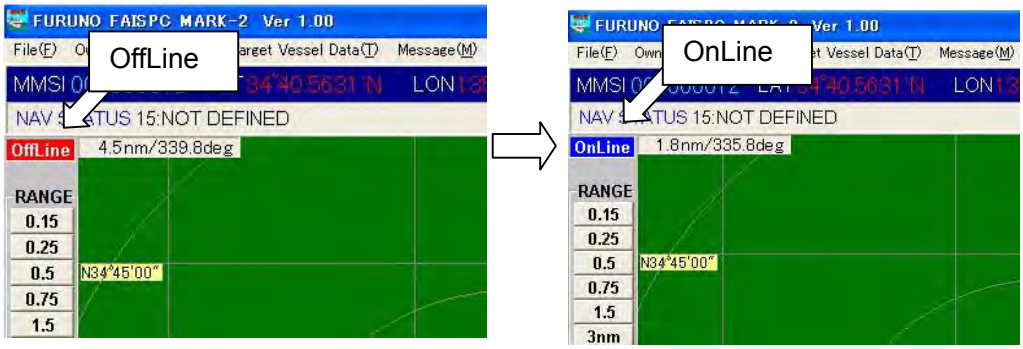
1. Open Option(P) of menu bar and choose Setting COM port.

2. The Setting COM port screen appears. Designate COM PORT and SPEED of PC connected and designate USE PORT, too.
   - COM PORT: Designate COM port of PC.
     Reference:
     COM PORT of PC can be confirmed by
     Control panel -> System -> Hardware ->
     Device manager -> Port.
   - SPEED : Set to 38400
   - USE PORT : Choose SIO



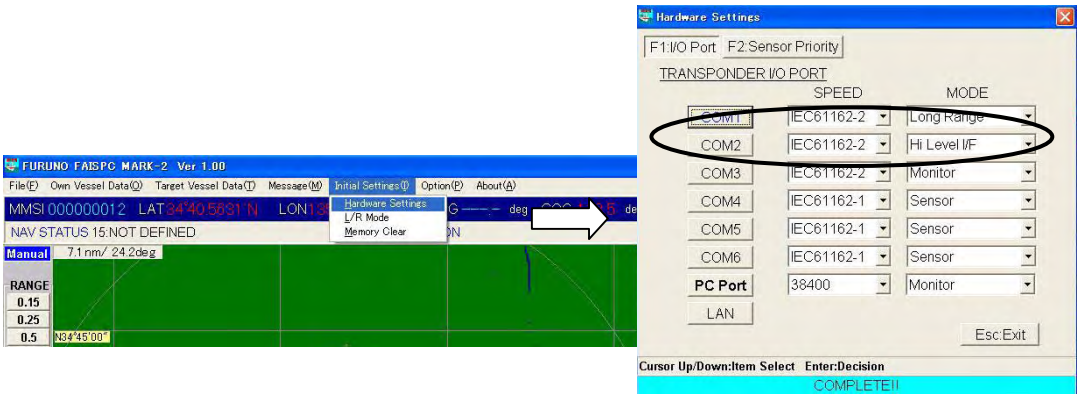
3. Upon completion of setting, click OK and close the Setting COM port screen.

4. By the step-3 setting, communication between FA-150 and PC (FAISPC MARK2) begins. When communication begins, “OffLine” displayed at the upper left of the FAISPC MARK2 screen changes to “OnLine.”



Reference:

The setting of I/O port of “Hardware settings” of Initial Settings(I) menu of the menu bar are the setting in the FA-150. It is same as setting of SET I/O PORT at FA-1502. In order to standardize the setting, for PC Port setting, set SPEED to 38400 and MODE to MONITOR.



In the event that setting of Option(P) -> Setting COM port -> SPEED of FAISPC MARK2 coincides with [MENU] -> INITIAL SETTINGS -> SET I/O PORT -> SET PC PORT -> SPEED of FA-150, communication begins between FA-150 and PC(FAISPC MARK2).
The setting of [MENU] -> INITIAL SETTINGS -> SET I/O PORT -> SET PC PORT -> MODE may not necessarily coincide with the setting of Initial Settings(I) -> Hardware -> PC port -> MODE of FAISPC MARK2.

** If the communication speed of PC is adjusted to that of FA-150, FA-150 automatically recognizes MODE as MONITOR through PFEC command from PC (FAISPC MARK2).**

AP5.2 Connection to LAN Port

AP5.2.1 Connection to PC

Mount the NET-100 board to the MAIN board as illustrated below.

- LAN kit: OP24-8
- Code No. 005-956-020

	Name	Code No.	Q'ty	Remarks
1	NET-100 board	008-535-840	1	03P9332
2	Spacer	000-801-678	4	

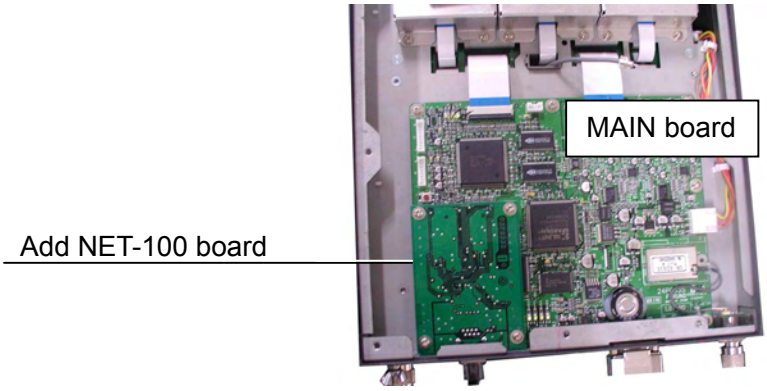


Fig. 5.2.1 Arrangement of NET-100

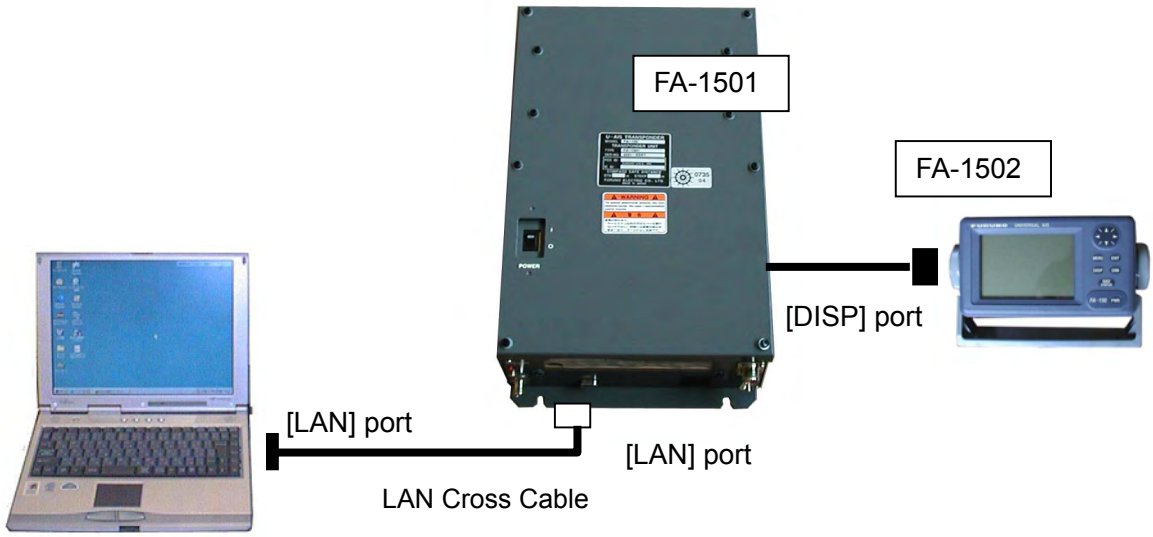


Fig. 5.2.2 Connection to PC

AP5.2.2 Setting of FA-150

1. Setting and confirmation of LAN port

1. Choose [MENU] -> INITIAL SETTINGS -> SET I/O PORT -> SET LAN PORT.

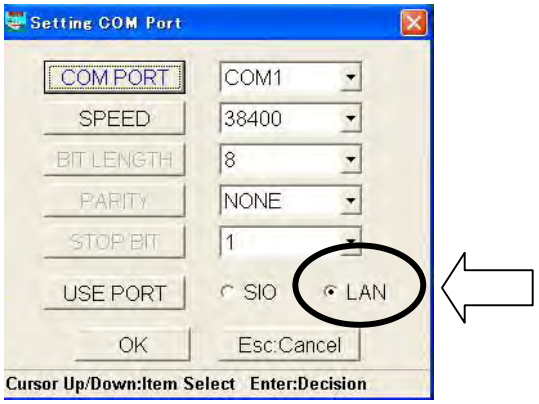
2. Set MODE to MONITOR. Settings of IP ADDRESS, SUB NET MASK, and PORT NO. may be kept to the factory defaults. If FA-150 is connected to the in-ship's LAN system, change these settings as required.

```
[SET LAN PORT]
MODE    : MONITOR
IP ADDRESS
          172.031.024.001
SUB NET MASK
          255.255.000.000
PORT NO.   :   10000
```

2. Setting of FAISPC MARK2

1. Open Option(P) of the menu bar and choose Setting COM port.

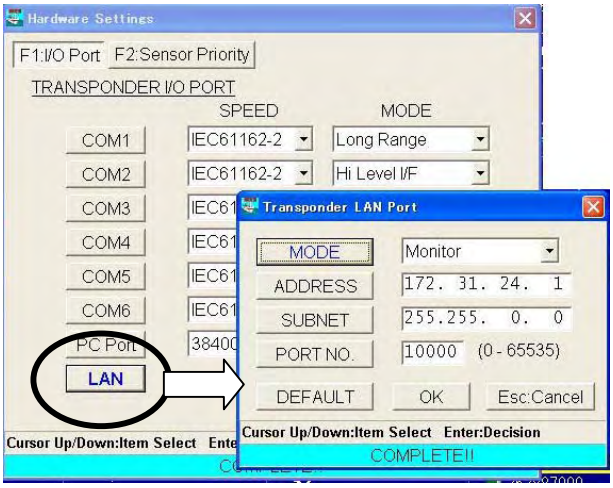
2. The Setting COM port screen is displayed. Set the USE PORT setting to LAN.



3. Upon completion of setting, click OK and close the Setting COM port screen.

3. Setting of IP of FAISPC MARK2

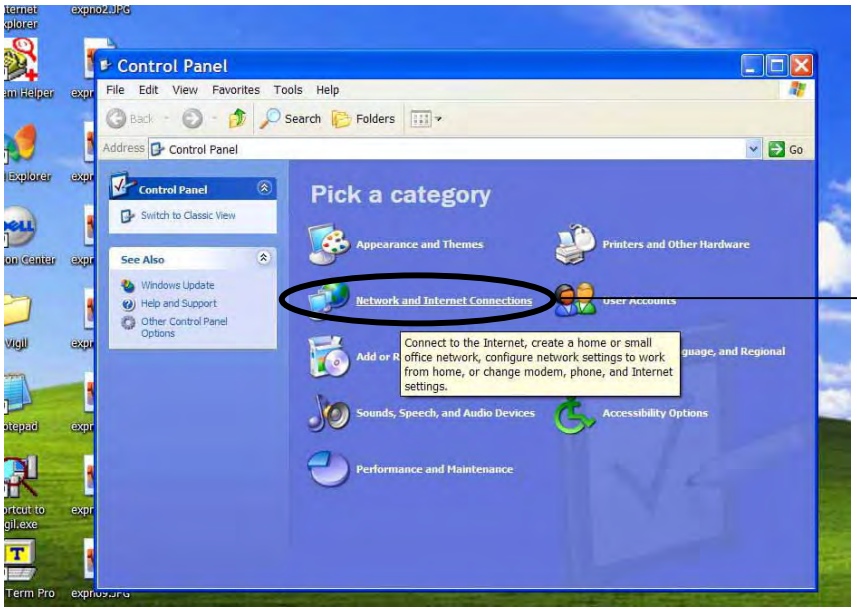
1. Choose Initial Settings(I) -> Hardware settings of the menu bar and click the LAN button.



2. Set MODE, ADDRESS, SUBJECT, and PORT NO. of Transponder LAN Port.
   For each setting, enter the value confirmed by "1. Setting and confirmation of LAN port." This setting is carried out to determine where FAISPC MARK2 is connected.
   - MODE : MONITOR
   - ADDRESS : Set IP ADDRESS confirmed at SET LAN PORT.
     (Default: 172.031.024.001)
   - SUBNET : Set SUB NET MASK confirmed at SET LAN PORT.
     (Default: 255.255.000.000)
   - PORT NO. : Set PORT NO. confirmed at SET LAN PORT.
     (Default: 10000)

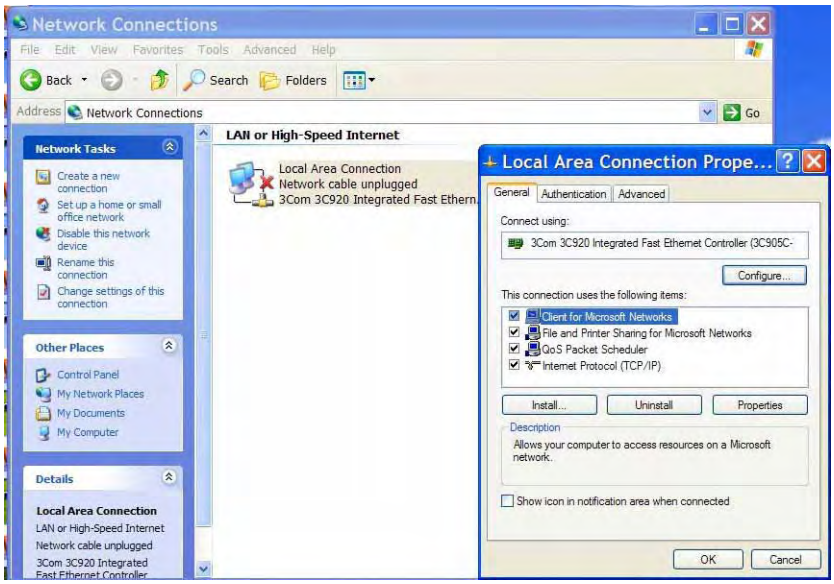
4. LAN setting of PC (Windows XP)

1. Open < Network and Internet Connections > of [Control panel].

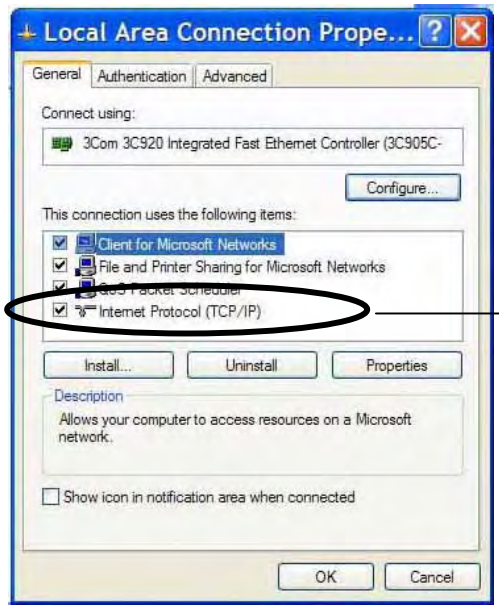

Control Panel
File Edit View Favorites Tools Help
Back Search Folders
Address Control Panel
Go
Control Panel
Switch to Classic View
See Also
Windows Update
Help and Support
Other Control Panel Options
Pick a category
Appearance and Themes
Printers and Other Hardware
Network and Internet Connections
User Accounts
Add or R
guage, and Regional
Connect to the Internet, create a home or small office network, configure network settings to work from home, or change modem, phone, and Internet settings.
Sounds, Speech, and Audio Devices
Accessibility Options
Performance and Maintenance

Right-click the Network and Internet Connections icon.

2. Choose “Network and Internet Connections” icon, right-click property. The following property of [local area connection] screen appears.

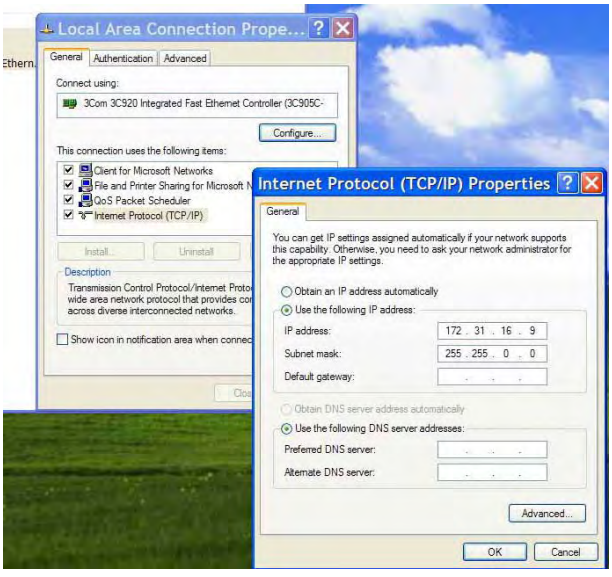


3. Click the “General” tab. Make sure Internet protocol (TCP/IP) has a check mark.

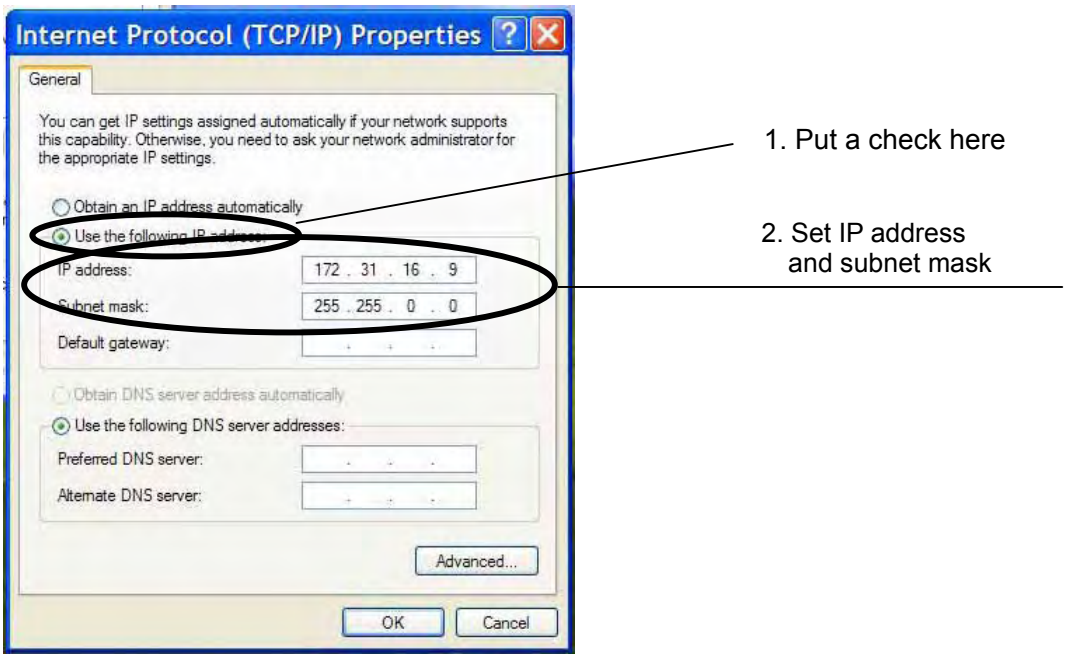


Make sure “Internet protocol (TCP/IP)” is checked.

4. Choose “Internet protocol (TCP/IP)” and click properties. The following Property of [Internet protocol (TCP/IP) property] screen appears.

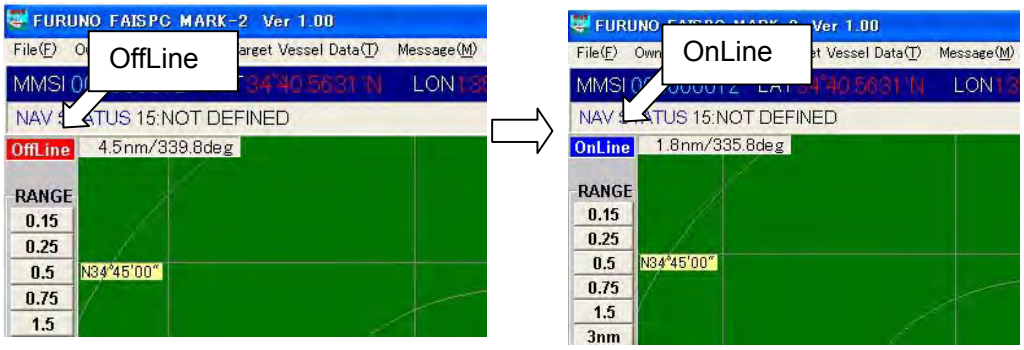


5. Check "Use the next IP address," and set IP address and subnet mask.
   The initial value of IP address of FA-150 is "172.031.024.001" and the subnet mask is "255.255.0.0." When setting is carried out on the basis of this value, the IP addresses that can be set include the following:
   - IP address
     172.031.xxx.xxX (for example, set 172.031.024.002.)
     Note; "X" is a numerical value other than 1. "1" is FA-150.
   - Subnet mask
     255.255.0.0


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
172 . 31 . 16 . 9
Subnet mask:
255 . 255 . 0 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel
1. Put a check here
2. Set IP address and subnet mask

6. Click OK and register the setting.

7. By the above setting, communication between FA-150 and PC(FAISPC MARK2) begins. When the communication begins, "OffLine" displayed on the upper left of the FAISPC MARK2 screen changes to "OnLine."

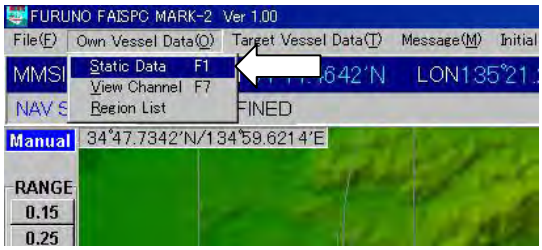


AP5.3 Set Static Data from FAISPC MARK2

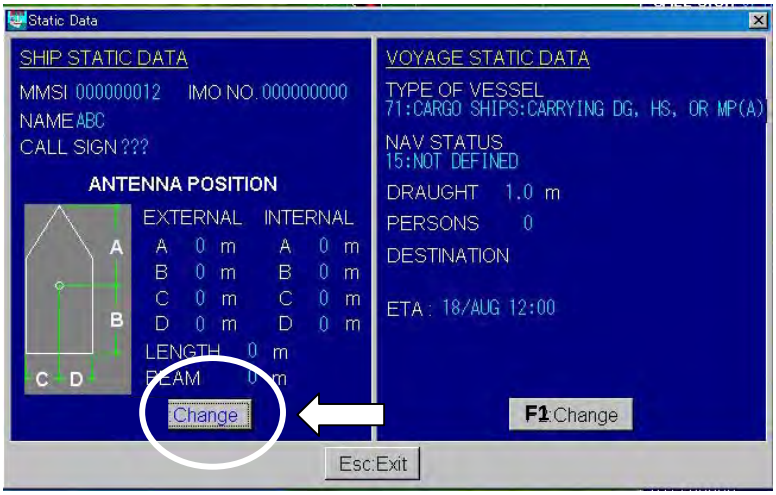
Never disclose the setting password to the user!!

Procedure

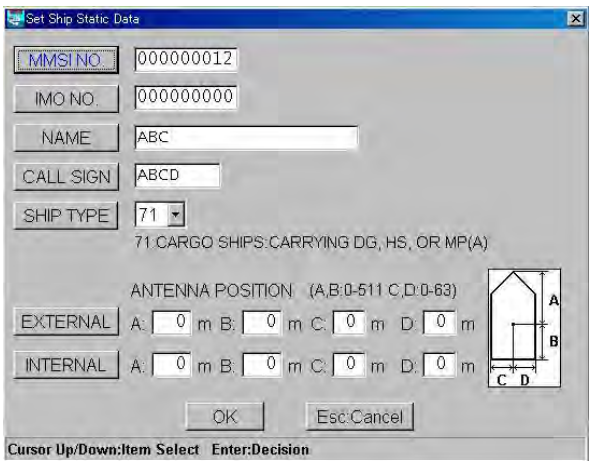
1. Choose Own Vessel -> Static Data on the menu bar.



2. The Static Data screen appears. Type password “FURUNO.” Button Change appears below SHIP STATIC DATA.



3. Clicking button Change causes the Ship Static Data screen to appear.


Set Ship Static Data
MMSI NO. 000000012
IMO NO. 000000000
NAME ABC
CALL SIGN ABCD
SHIP TYPE 71
71 CARGO SHIPS:CARRYING DG, HS, OR MP(A)
ANTENNA POSITION (A,B:0-511 C,D:0-63)
EXTERNAL A: 0 m B: 0 m C: 0 m D: 0 m
INTERNAL A: 0 m B: 0 m C: 0 m D: 0 m
OK
Esc:Cancel
Cursor Up/Down:Item Select Enter:Decision

4. Setting MMSI, etc. and clicking the OK button displays the password entry screen.

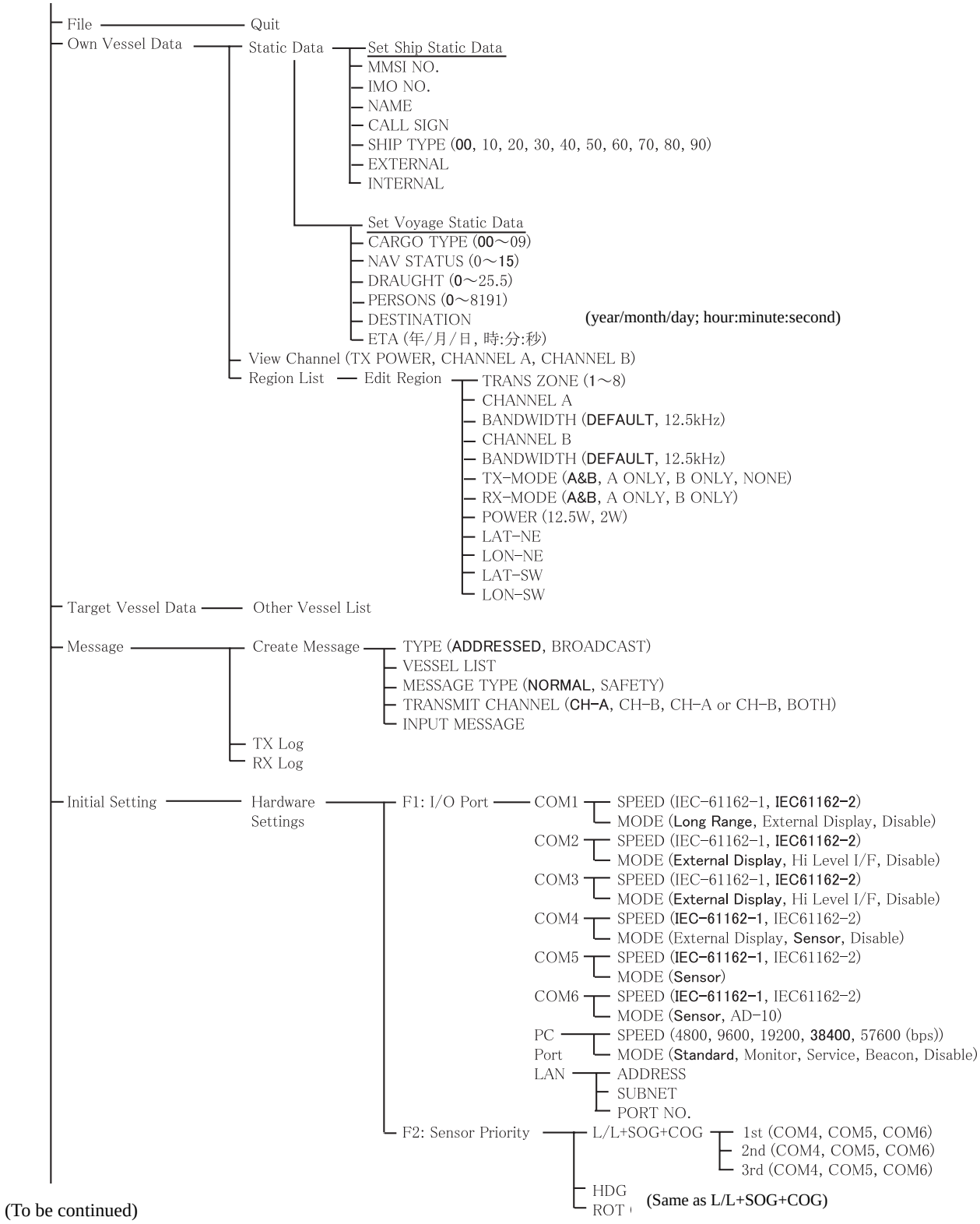
5. The password is “652111.” Enter this password and click the OK button.

6. Upon completion of setting, be sure to close FAISPC MARK2 once.

AP5.4 Menu tree of FAISPC MARK2

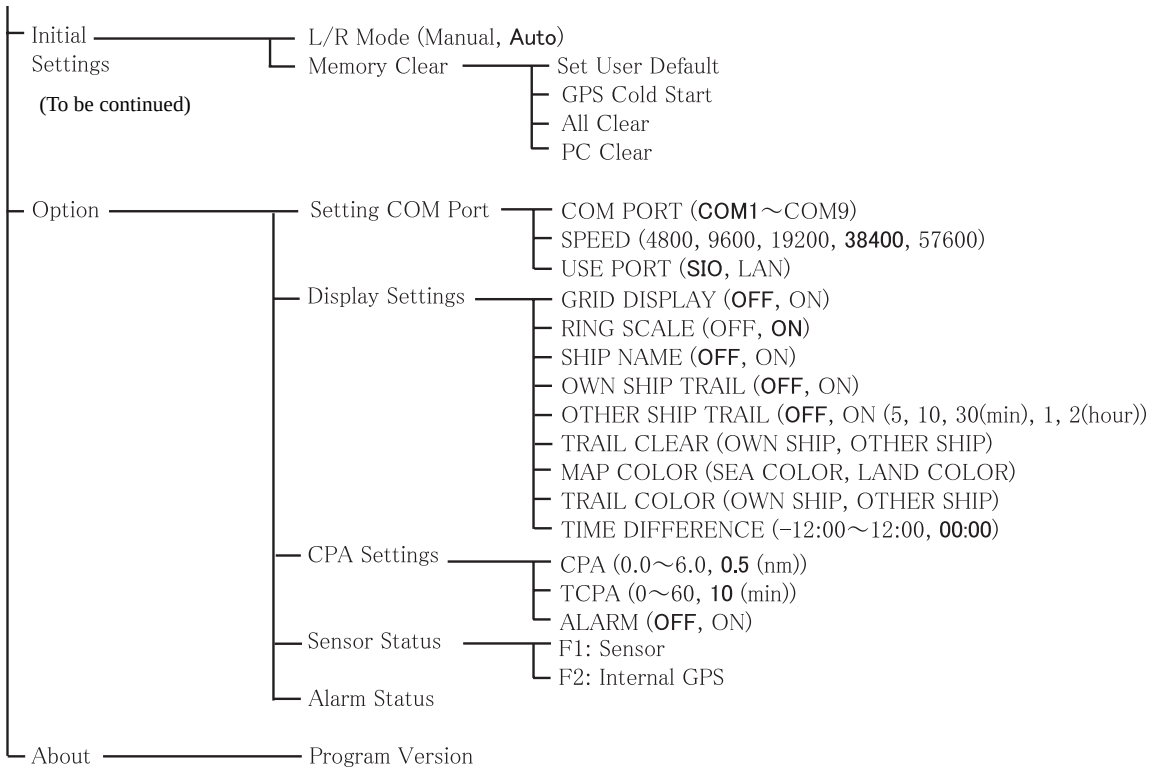
The factory defaults are shown in Gothic script (in boldface).

Menu bar



(To be continued)

(Continued)


Initial Settings
(To be continued)
L/R Mode (Manual, Auto)
Memory Clear
Set User Default
GPS Cold Start
All Clear
PC Clear
Option
Setting COM Port
COM PORT (COM1～COM9)
SPEED (4800, 9600, 19200, 38400, 57600)
USE PORT (SIO, LAN)
Display Settings
GRID DISPLAY (OFF, ON)
RING SCALE (OFF, ON)
SHIP NAME (OFF, ON)
OWN SHIP TRAIL (OFF, ON)
OTHER SHIP TRAIL (OFF, ON (5, 10, 30(min), 1, 2(hour))
TRAIL CLEAR (OWN SHIP, OTHER SHIP)
MAP COLOR (SEA COLOR, LAND COLOR)
TRAIL COLOR (OWN SHIP, OTHER SHIP)
TIME DIFFERENCE (-12:00～12:00, 00:00)
CPA Settings
CPA (0.0～6.0, 0.5 (nm))
TCPA (0～60, 10 (min))
ALARM (OFF, ON)
Sensor Status
F1: Sensor
F2: Internal GPS
Alarm Status
About
Program Version

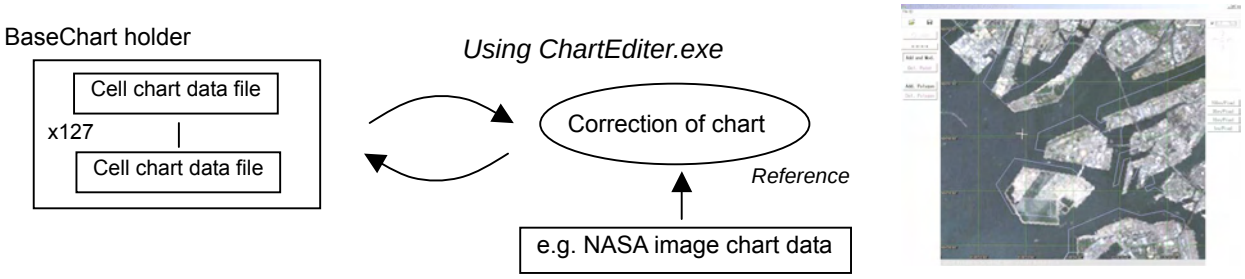
AP5.5 Editing of a Base chart

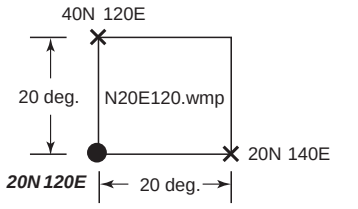
AP5.5.1 Overview

1. Base chart

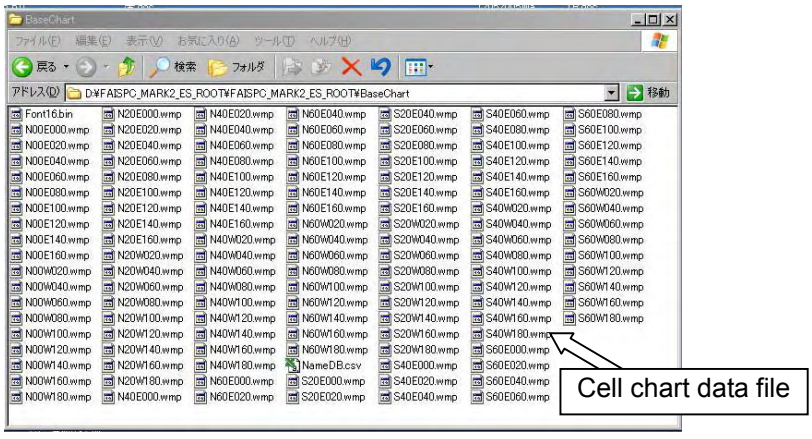
The chart of a PC MKD display is produced based on the WGS-84. This chart (base chart) can edit an island, the coastline, etc. by using "ChartEditer.exe." For example, the coastline can be edited based on a satellite photograph. e.g. download image chart data from NASA homepage.

The Base chart data (127 cell chart data files) are the "BaseChart" holder in the “FAISPC_MARK2_ROOT” holder, and link up with each the cell chart files covers the worldwide. In addition, cell chart data files covers the range of 20 degrees of N(S)/E(W). For example, "N20E120.wmp" of a filename shows the position at the South-West corner of a base chart.





Coverage of cell chart data



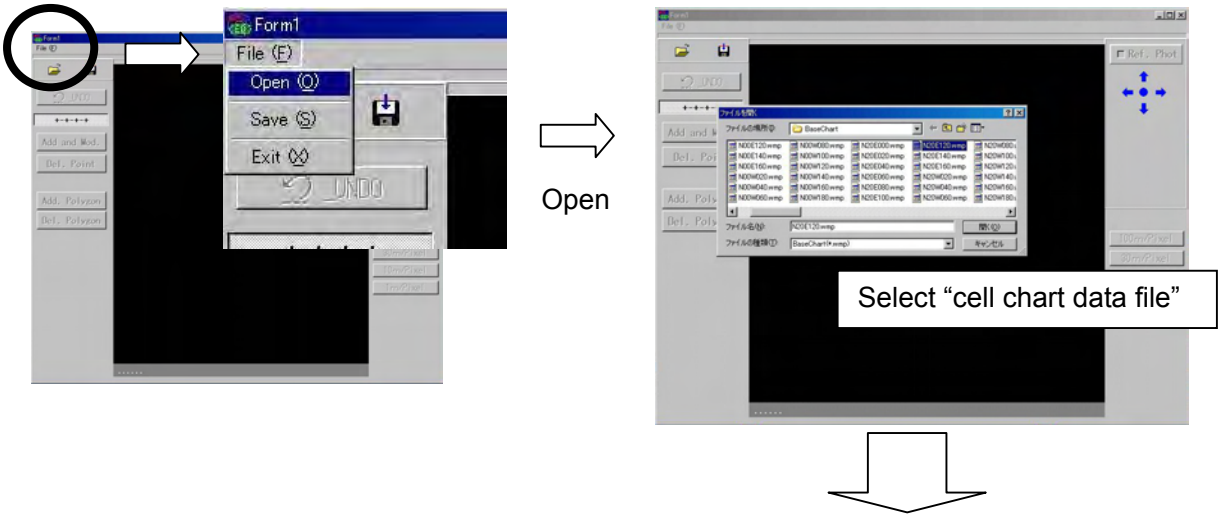
Base Chart (Cell chart files)

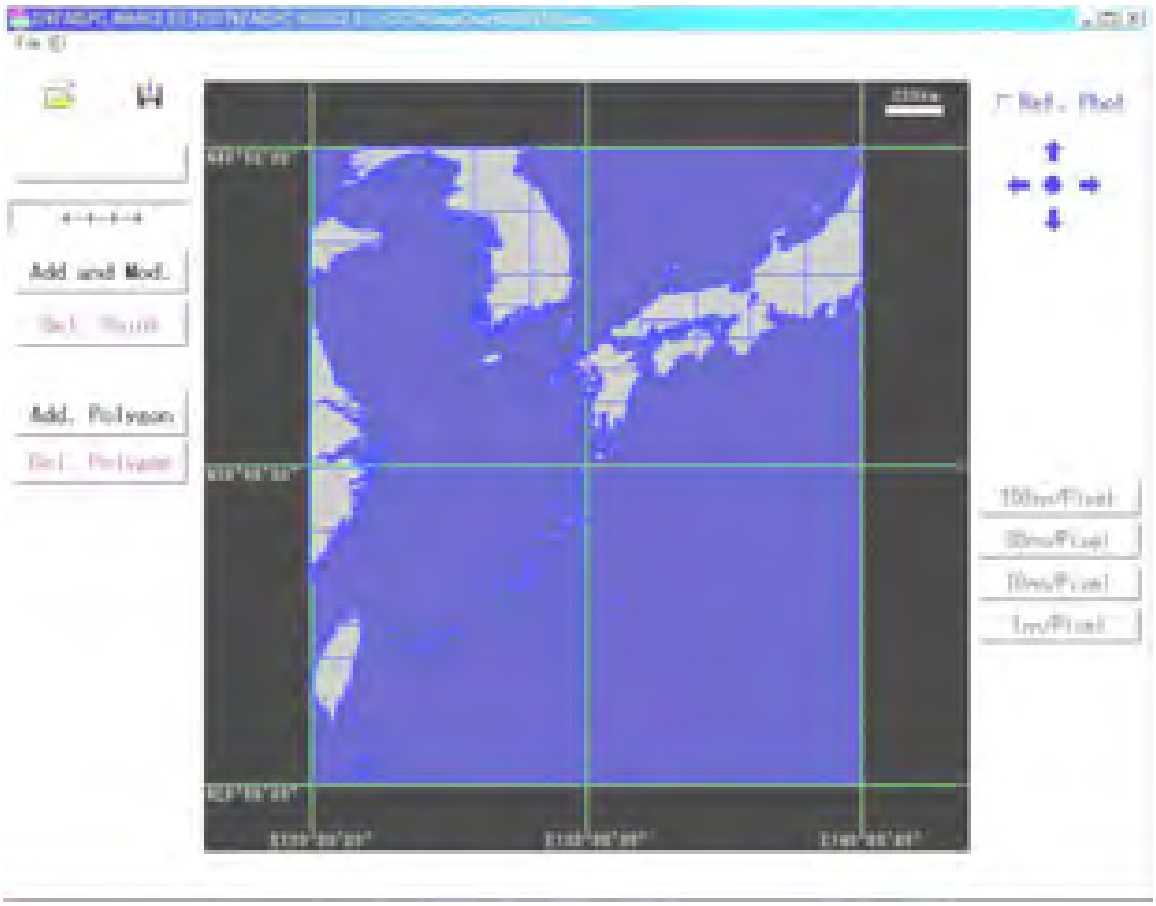
2. Utility software: ChartEditor.exe

The utility software: ChartEditor.exe that edits a base chart is software for Furuno-dealer. The utility software download in the Furuno Tech.Net.

AP5.5.2 Open the ChartEditor.exe

Click the “ChartEditor.exe.” file to start the ChartEditor.
Select “Open(O)” from File(F) menu of the ChartEditor and a base chart (cell chart data file) to edit from BaseChart holder.





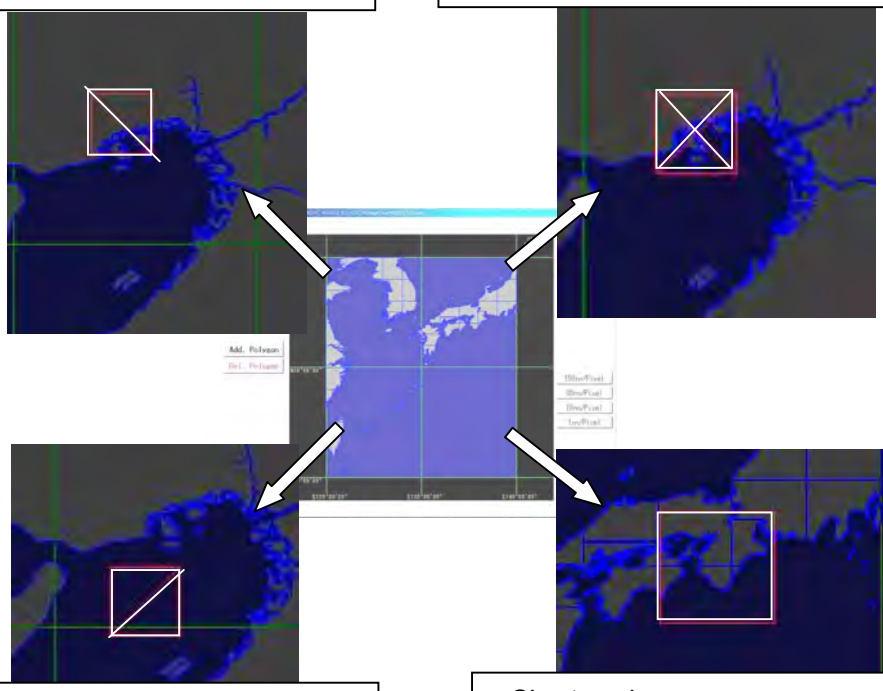
AP5.5.3 Basic operation

1. Operation of a base chart display

Set a pointer on a base chart display, press the right and left button of a mouse and drag. A function changes with drug directions.

- It returns to the operation chart display of one time ago.
  Press the right and left button of a mouse, and drag to the direction of the upper left.

- It returns to the original chart (20-degree angle).
  Press the right and left button of a mouse, and drag to the direction of the upper right.

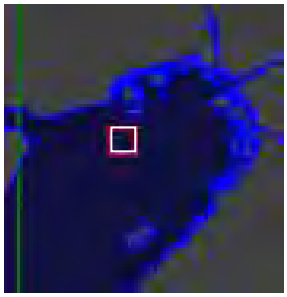


- The present chart is set to one half.
  Press the right and left button of a mouse, and drag to the direction of the lower left.

- Chart scale up
  Set a pointer on the upper right of the area to scale up, press the right and left button of a mouse, and drag to the direction of the lower right to the range to scale up.

Centering:

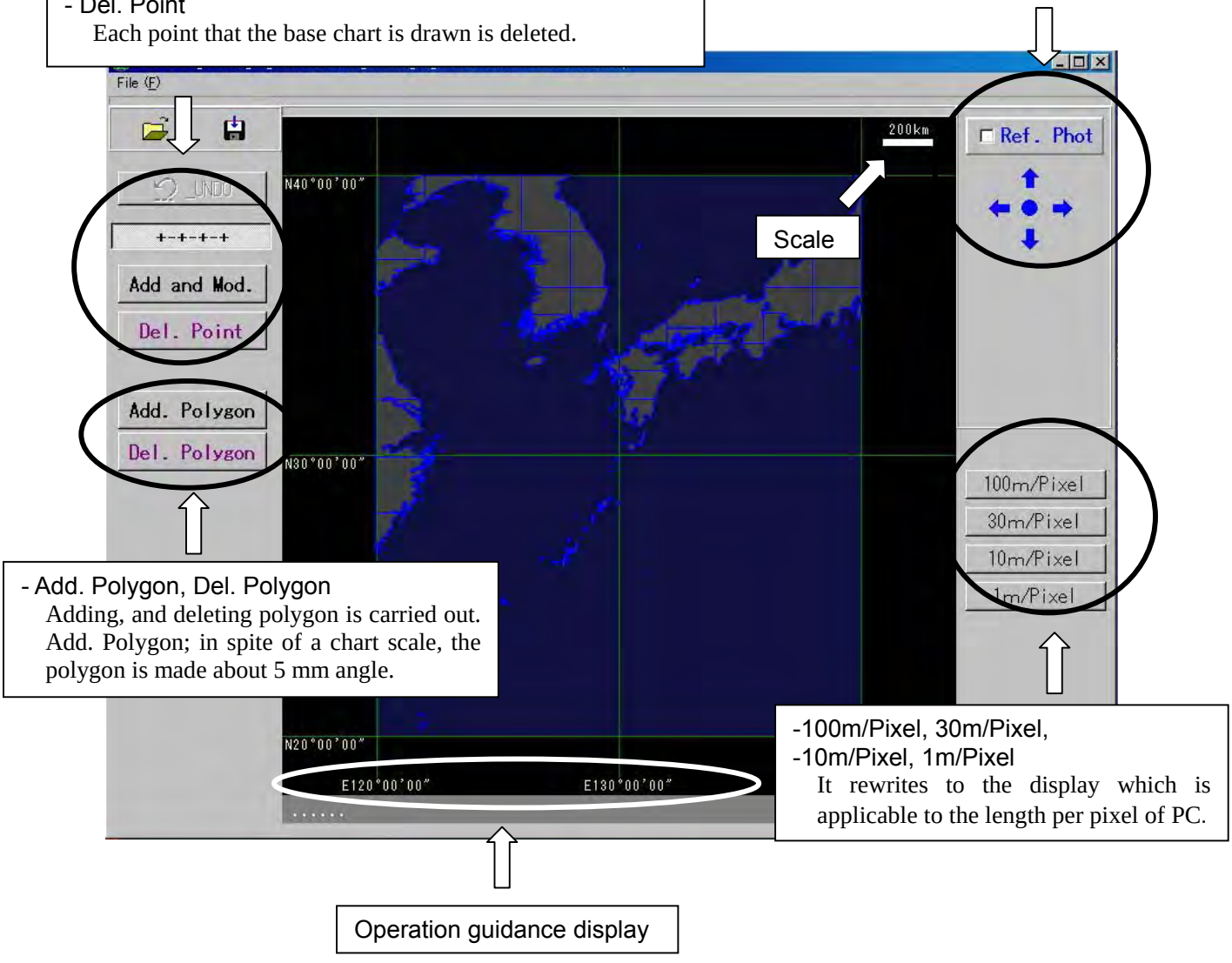
Set a pointer on a position to make it move centering on a display, and click the right and left button of a mouse.



2. Overview of the button function

- UNDO
  Cancel of the performed operation.
- +-+-+-+
  Cancel of the operation function which tries to perform.
- Add and Mod.
  Editing of the each line and the point that the base chart is drawn are performed.
- Del. Point
  Each point that the base chart is drawn is deleted.

- Ref. Phot
  By a check mark, the image chart data of the "jpg" form specified at the base chart can be downloaded. An arrow button shows movement of the downloaded image chart data.



- Add. Polygon, Del. Polygon
  Adding, and deleting polygon is carried out. Add. Polygon; in spite of a chart scale, the polygon is made about 5 mm angle.

-100m/Pixel, 30m/Pixel,
-10m/Pixel, 1m/Pixel
It rewrites to the display which is applicable to the length per pixel of PC.

Operation guidance display

Polygon:
For example, polygon is an island.

AP5.5.4 Editing of the base chart

1. Add. Polygon：Polygon is added.

It is used when adding new polygons to a base chart. The size of the polygon to add is respectively about 5 mm regardless of the scale of a chart. The size of the added polygon, form and position are correctable later.

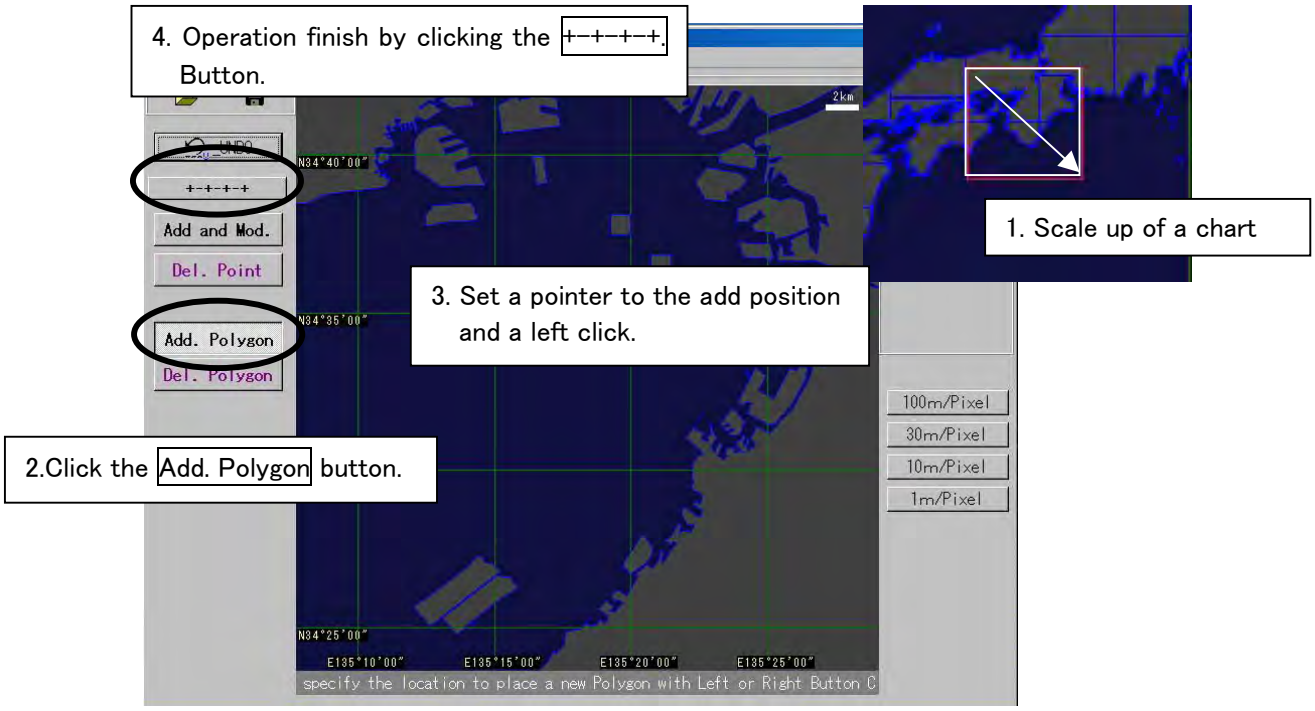
Procedure

1. You must scale up the base chart part of the position to add.
   Sets a pointer at the upper left of the area to scale up. And then, press the right and left button of the mouse and drag to the direction of the lower right to the expansion range. Repeat this operation to the scale to edit.

2. Click the Add. Polygon button.

3. Set a pointer on the position which adds an island, and right or left click to add an island. This operation can be performed continuously.

4. Left click the +-+-+-+ button when finishing the Add. Polygon operation.



Add. Polygon Operation guidance message:

Specify the location to place a new Polygon with Left or Right Button Click

2. Del. Polygon : deleting a polygon

This is used when deleting polygons such as land drawn by the closed line or polygons added by Add.Polygon operation

Procedure

1. You must scale up or scale down the base chart part of the position to delete.

2. Click the Del. Polygon button.

3. When the pointer is set to the polygon to delete and a right or left click is carried out, the chosen polygon changes to red, and the "?" mark is displayed on the polygon to delete. Right click when you choose the island to delete accidentally.

4. Left click when deleteing a polygon.
   Left click the UNDO button, when you deleted accidentally.

5. When finishing the Del. Polygon operation, left click the +-+-+-+ button.

Del. Polygon Operation guidance message :

1) Specify Polygon to be deleted with Left or Right Button Click
2) Delete -> Left Button Click, cancel -> Right Button Click

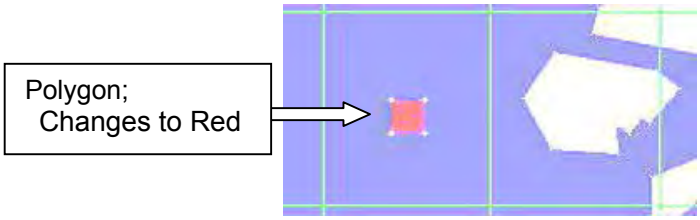
3. Add and Mod. and Del. Point：Editing of the polygon

Change of the position to constitute a polygon, addition and deletion are performed. Refer to the operation guidance column for basic operation.

1. Add. and Mod. Operation

1) When specifying the polygon for modification;

Click the Add and Mod. button, and set a pointer to the target polygon. And then, the selected polygon changes to a red by clicking a right or left click.



Add. Polygon Operation guidance message:

Select Polygon to be edited. Left or Right Button Click

Short-cut key: change polygon -> CTRL+L/R

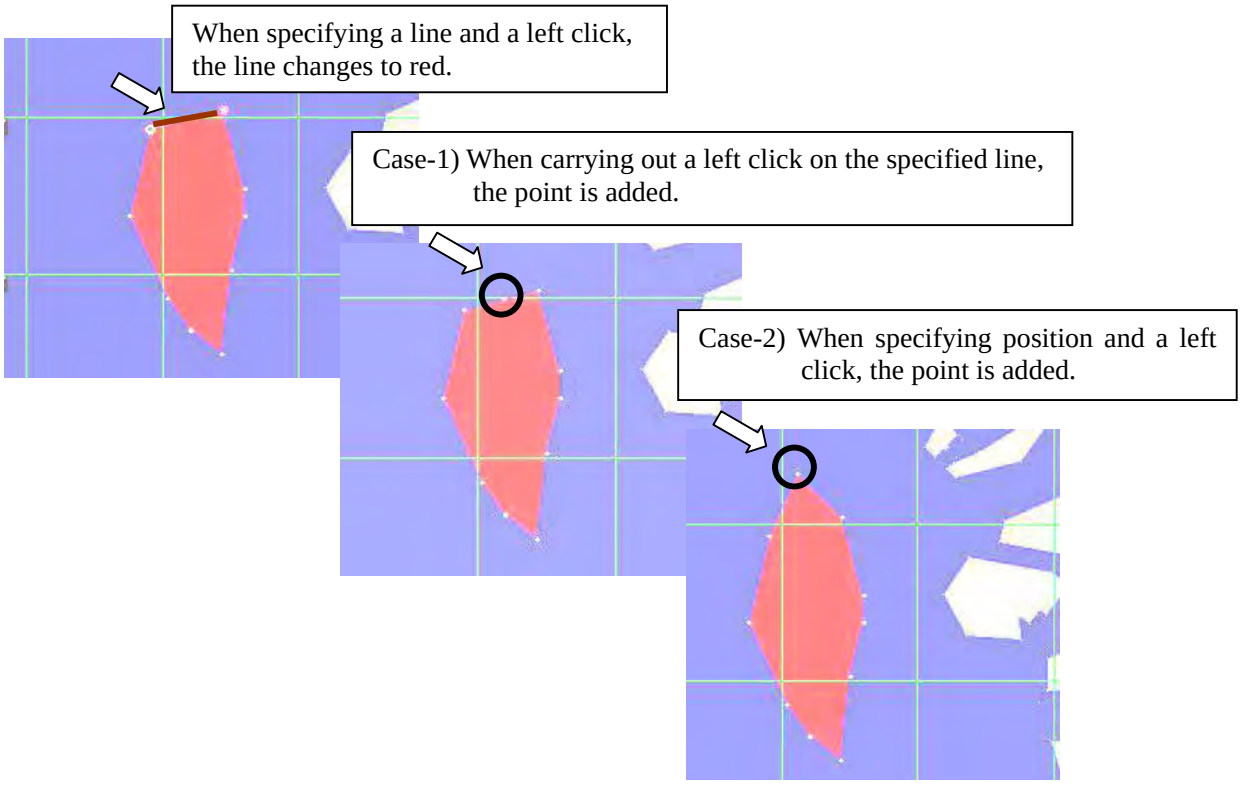
When specifying a polygon;

Set a pointer to the target polygon, right or left click with pressing the Ctrl key.

2) When adding a point to the polygon;

Procedure

1. Specify the target polygon to modify.
2. When the pointer is set to the line to add and left click is carried out, the chosen line changes to red.
3. Set a pointer on the position of the point to add and a left click.
   Left click the UNDO button, when you added accidentally.


When specifying a line and a left click, the line changes to red.
Case-1) When carrying out a left click on the specified line, the point is added.
Case-2) When specifying position and a left click, the point is added.

Add. Polygon Operation guidance message:

add point -> Left or Right Button Click
add point -> Left Button Click , move point -> Right Button Click ,
change polygon -> CTRL+L/R

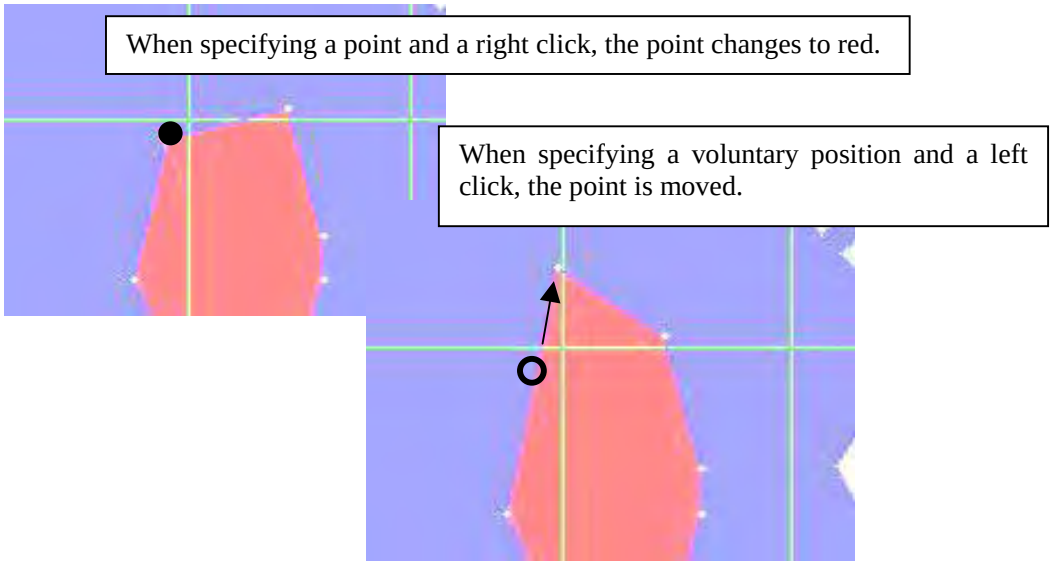
3) When moving the point of a polygon;

Procedure

1. Specify the target polygon to modify.

2. When the pointer is set to the position to move and right click is carried out, the chosen point changes to red.

3. Set a pointer on the position of the point to move and a left click.
   Left click the UNDO button, when you moved accidentally.


When specifying a point and a right click, the point changes to red.
When specifying a voluntary position and a left click, the point is moved.

Add. Polygon Operation guidance message :

add point -> Left or Right Button Click
add point -> Left Button Click , move point -> Right Button Click ,
change polygon -> CTRL+L/R

4) When combining the point of a polygon and other point of a polygon;

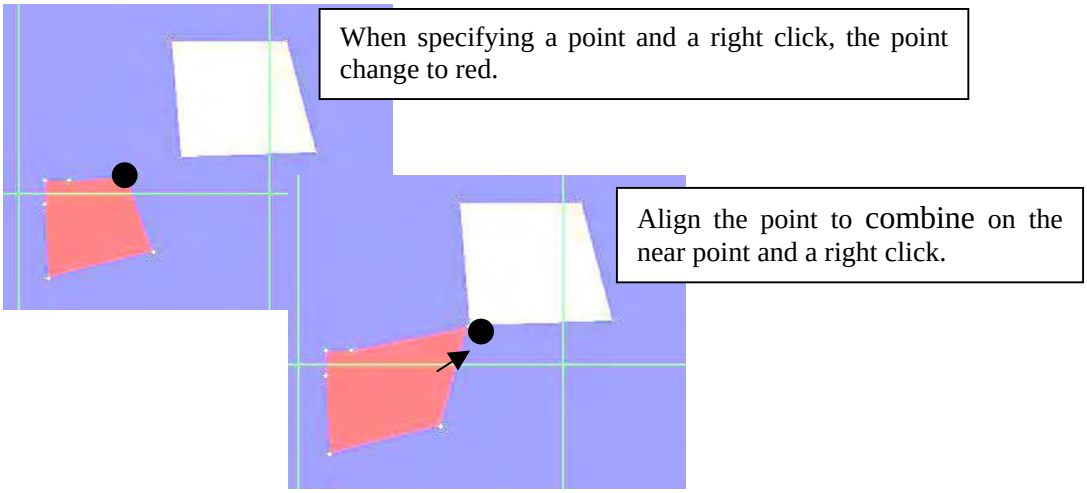
Procedure

1. Specify the target polygon to modify.

2. When the pointer is set to the position to combine and right click is carried out, the chosen point changes to red.

3. Set a pointer near the point of other polygons to combine.

4. When a right click is carried out, a combine the point of polygon and the point of other polygon. Left click the UNDO button, when you combine accidentally.


When specifying a point and a right click, the point change to red.
Align the point to combine on the near point and a right click.

Del. Polygon Operation guidance message:

delete point -> Left or Righ Button Click. change Polygon -> CTRL+L/R
delete point -> Left Button Click, cancel -> Right Button Click

2. Del. Point operation

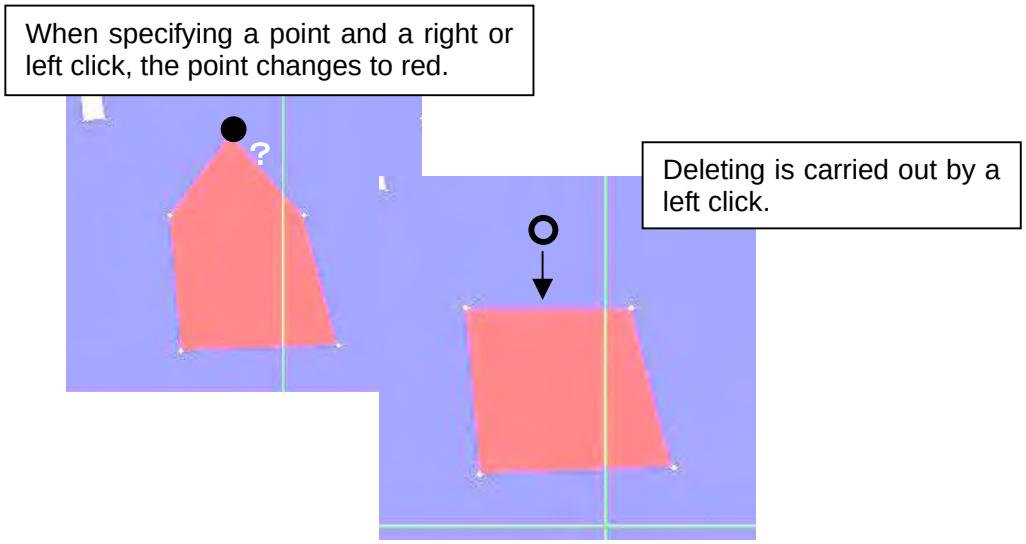
To delete a point of the polygon;

Procedure

1. Click the Del. Point. button, set a pointer to the target polygon and a left click. The chosen point changes to red.

2. When the pointer is set to the position to delete and right or left click is carried out, the chosen point changes to red, and the "?" mark is displayed.

3. Furthermore, left click deletes the point.
   Left click the UNDO button, when you deleted accidentally.



Del. Polygon guidance message:

Delete point -> Left or Righ Button Click. change Polygon -> CTRL+L/R
Delete point -> Left Button Click, cancel -> Right Button Click

AP5.5.5 Downloaded “World Wind” from the NASA homepage

In order to use the image chart data of NASA, you have to download “World_Wind_1.3.3.1_Full.exe” of free software from the NASA homepage.

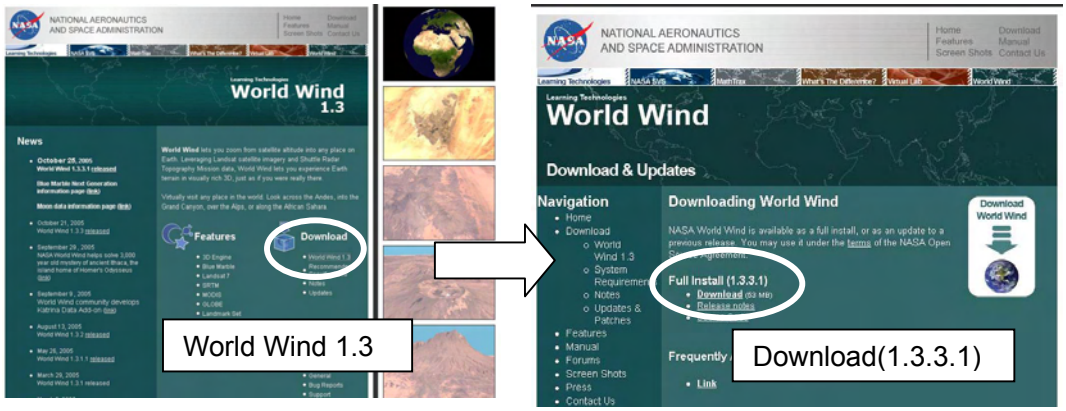
The required specification of PC is;

- Windows 2000 or XP
- 256 MB of RAM
- DSL/Cable connection or faster
- Intel Pentium 3.1 GHz or AMD Athlon
- 3D Graphics Card
- 2GB of disk space

Procedure of download

1. Open “http://worldwind.arc.nasa.gov/ ”.

2. Click the “World wind 1.3” from the Download column and download this software.



3. When download is completed, the icon of “World wind_1.3.3.1_Full.exe” is made. The “World Wind 1.3” is installed by this icon.

Note:

Please install this, if installation of "DirectX" software is required during installation of “World Wind 1.3”.

AP5.5.6 Download the NASA image chart data

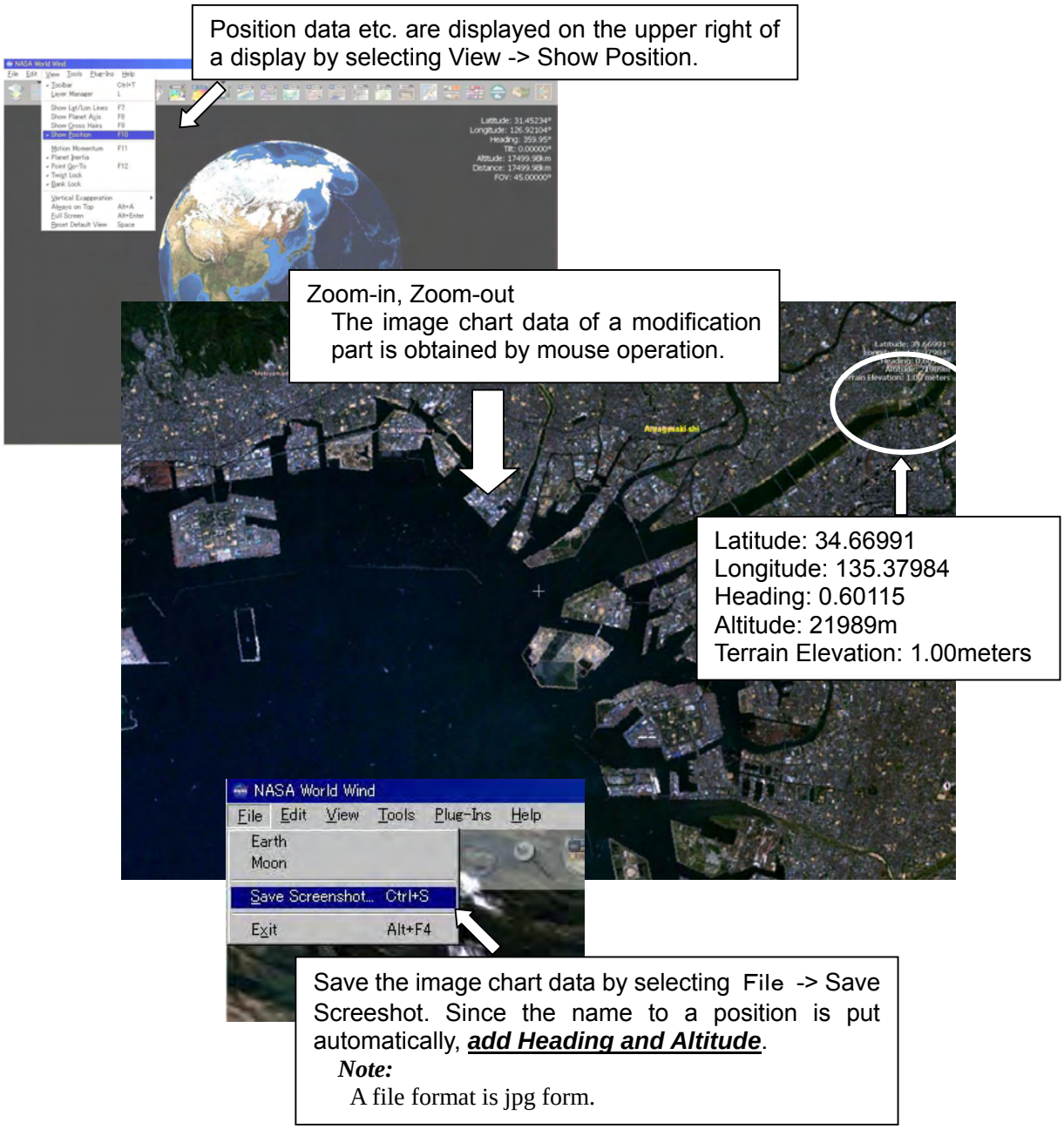
Click the “World Wind 3.1” and install the image chart data of the modification part of a base chart into PC by "jpg" form.

The filename of the image to install is;

“latitude_ longitude_ the direction angle（Heading）_
camera altitude (Altitude)_comment (if required).jpg” form

Example) 135.37984E_34.66991N_0.60115_21989.jpg

In addition, latitude/longitude is the center of an image chart.

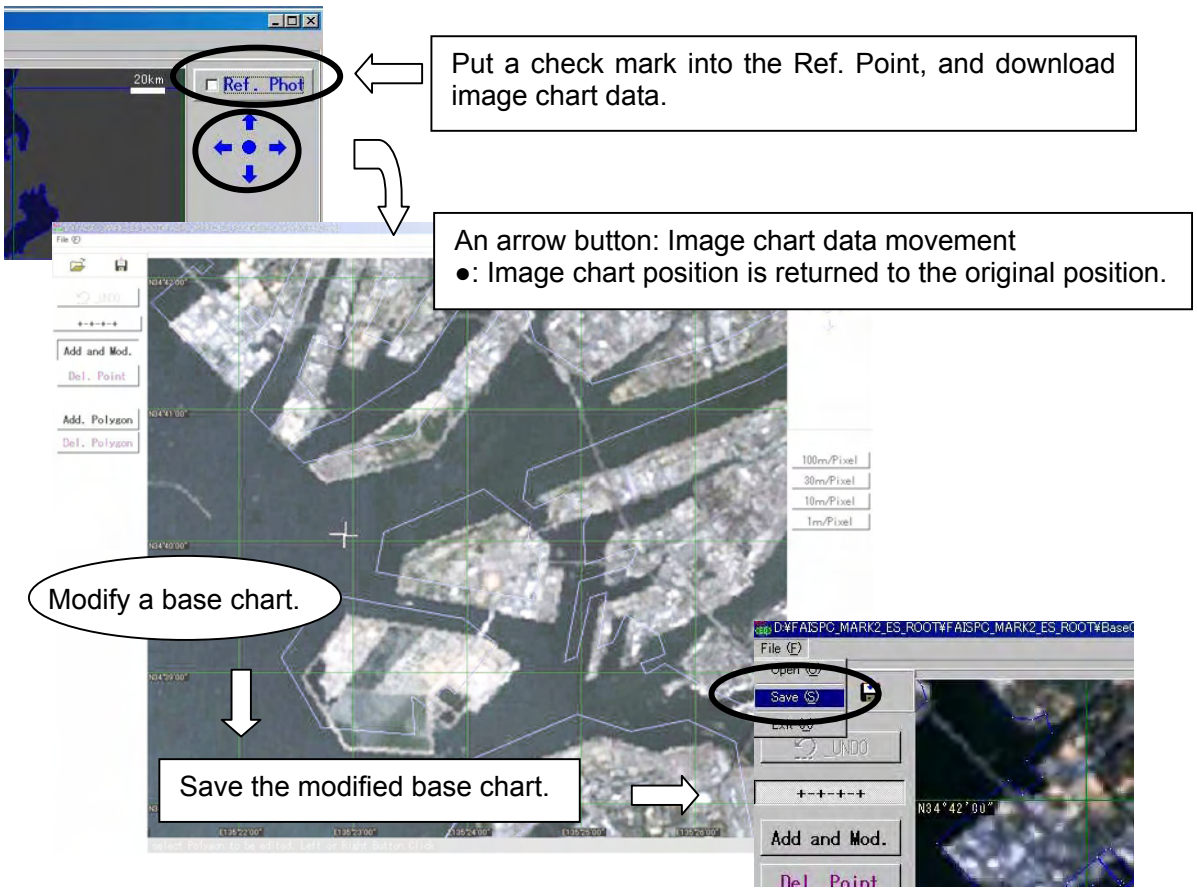

Position data etc. are displayed on the upper right of a display by selecting View -> Show Position.
Zoom-in, Zoom-out
The image chart data of a modification part is obtained by mouse operation.
Latitude: 34.66991
Longitude: 135.37984
Heading: 0.60115
Altitude: 21989m
Terrain Elevation: 1.00meters
NASA World Wind
File Edit View Tools Plug-Ins Help
Earth
Moon
Save Screenshot... Ctrl+S
Exit Alt+F4
Save the image chart data by selecting File -> Save Screeshot. Since the name to a position is put automatically, add Heading and Altitude.
Note:
A file format is jpg form.

AP5.5.7 Editing a base chart by using the NASA image chart data.

The download image chart data is installed into a base chart, and you can edit a base chart.

Procedure

1. Put a check mark into the Ref. Point and select a file to install.
2. Since an image chart data is put on a base chart, an image chart data can be moved and be overlapped. An arrow button carries out movement of an image. And you must put on the standard position of the base chart.
3. Modify a base chart along the coastline of an image.
4. After finishing a modification of a base chart, save by selecting File-> Save operation.



AP6.1 AIS Specification Changes

Key Points

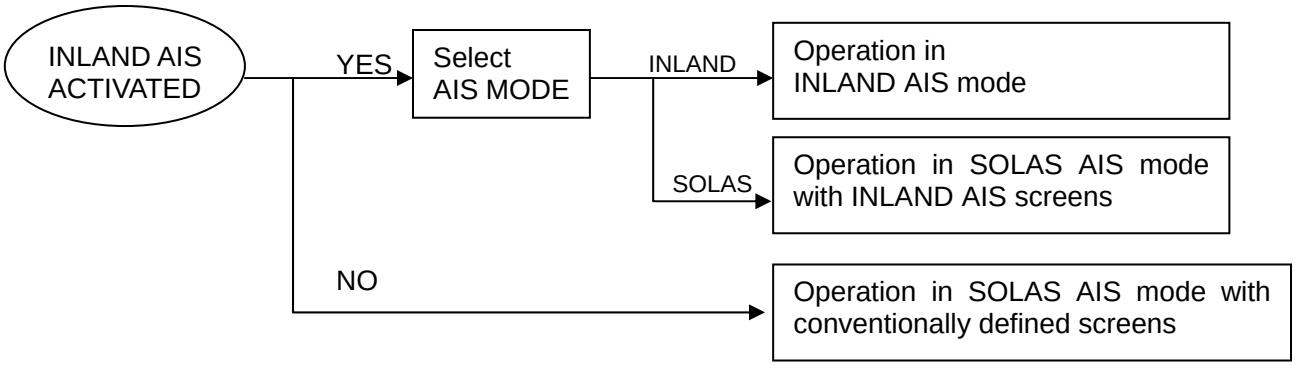
The software and hardware have been revised for the addition of the INLAND AIS specification, and for comply with ITU-R M.1371-3.
The new software is common to INLAND AIS and Class A AIS required by SOLAS (hereafter referred to as SOLAS AIS). To use the software in SOLAS AIS, no special setting configuration is necessary even if the software or hardware is updated. The operation is the same as is conventionally done.

1. Software version with support for INLAND AIS and ITU-R M.1371-3
   FA-1501: Ver. 02.02 / FA-1502: Ver. 02.01

2. Board with support for INLAND AIS
   MOT board version: 24P0074-33 and after

3. "ACTIVATE KEY" code setting required to enable the INLAND AIS specification
   The "ACTIVATE KEY" code is issued based on the "DEVICE ID" code, which should be provided to Furuno.
   Note)
   The code mentioned above is stored on the MAIN board.

4. Enter the ACTIVATE KEY to have the INLAND AIS specification "ACTIVATED," which allows the AIS MODE to be switched between INLAND AIS and SOLAS AIS.



5. Support for INLAND AIS specification provided starting with the production in November 2009: SNo. 3552-9105 and after

6. SOLAS AIS comply with ITU-R M.1371-3 will be required of SOLAS vessels that will exam the "SR" on April 6, 2010 and after.

AP6.1.1 Software

Be sure to update the software for both FA-1501 and FA-1502 regardless of the addition of the INLAND AIS specification or support for the ITU-R M.1371-3.
For comply with ITU-R M.1371-3, the version of the MOT board is not requierd.

Table AP6.1.1 Software and Hardware with support for INLAND AIS/ITU-R M.371-3

Change	Old software/hardware	New software/hardware (INLAND AIS/ITU-R M.1371-3)
FA-1501 software	2450018-01.10	2450018-02.02
FA-1502 software (Boot)	2450020-01.13	2450020-02.01
FA-1502 software (application)	2450021-01.07	2450020-02.01
Hardware (MOT board)	24P0036-22	24P0036-33

Note)

When the software is updated, the DESTINATION and USER SETTINGS backup data of FA-1502 are erased. Be sure to record the data before updating.

AP6.1.2 Hardware

To operate as SOLAS AIS, the version of the MOT board is not requied.
For comply with to ITU-R M.1371-3, only software update is necessary.

Table AP6.1.2 Compatibility of new and old software/hardware

MOT board	New software: 02.02	Old software: 01.07
24P0036-22 (old)	INLAND function not available Support for ITU-R M.1371-3 (Class A AIS)	Support for Class A AIS (ITU-R M.1371-1)
24P0036-33 (new)	INLAND function available Support for ITU-R M.1371-3 (Class A AIS)	Support for Class A AIS (ITU-R M.1371-1)

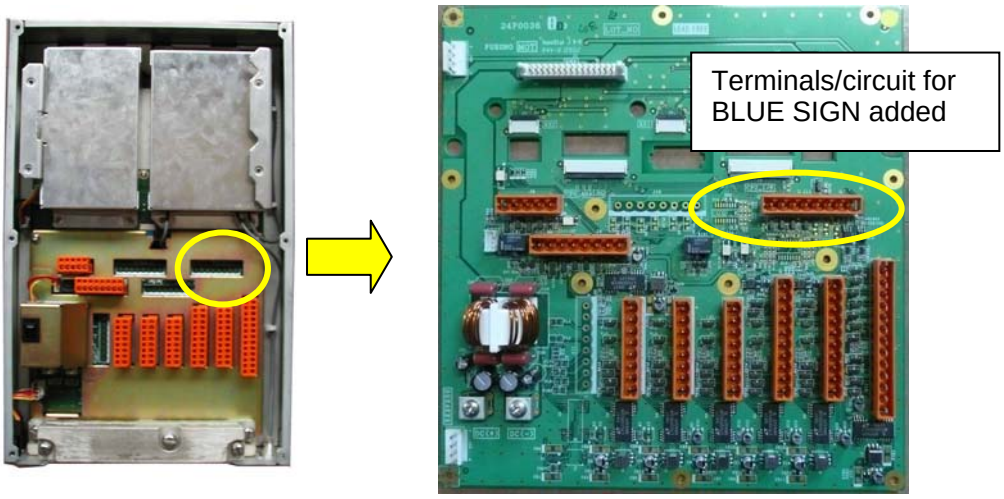


Figure AP6.1.1 MOT board version: 24P0074-33

Hint)

Go to [MENU] -> DIAGNOSTICS -> TRANSPONDER TEST -> MEMORY TEST.
If the "MOT HW" of the menu is "1," the MOT board version is 24P0074-**33** and after.
If the MAIN board detects "1," "DEVICE ID" is displayed in the ACTIVATE KEY menu, which can be accessed by going to [MENU] -> DIAGNOSTICS -> ACTIVATE KEY menu. This DEVICE ID is generated based on the time data input for the first time.

AP6.1.3 SOLAS AIS

Update the software FA-1501 to Ver. 02.02 and FA-1502 to Ver. 02.01. No special setting configuration is necessary. The version of the MOT board is not requied.

For ITU-R M.1371-3

1) [MENU] -> DIAGNOSTICS -> ACTIVATE KEY has been added.
   Note)
   To enable the INLAND AIS mode, enter the ACTIVATE KEY code.
   Entry of this code is not necessary for operating in the SOLAS AIS mode.

2) The definition of the Low Power has been changed from 2 W to 1 W. This is the transmission output used when MSG.22 is transmitted by the VTS or LOW POWER is specified with the "regional area operation" setting.
   The tanker mode function is enabled as it has been.
   To measure the transmission output, go to [MENU] -> DIAGNOSTICS -> FOR SERVICE -> CH&PWR SETTINGS and set the CH SET to MANUAL to allow the setting of 0 W, 1 W, 2 W or 12.5 W.

3) MSG.23 (Group Assignment Message) from base stations is supported.
   MSG.23 is a management message used in Class B AIS sent from base stations for setting a regional area. Position report is given via MSG.2 at a rate according to this message.

4) Regardless of whether D-GPS or GPS is used for positioning, the reference for the accuracy has been changed to 10 m. If the PA (Position Accuracy), which is accessed by going to [MENU] -> INTERNAL GPS, is "H," the positioning accuracy is within 10 m. The PA data is included in the position report via MSG. 1, 2 and 3.

5) The indication of whether the MOT board supports INLAND AIS specification has been added. To show this information, go to [MENU] -> DIAGNOSTICS -> TRANSPONDER TEST -> MEMORY TEST -> MOT HW.
   If the MOT board version is 24P0074-33 and after, MOT HW "1" is shown.

6) The display of data received from respective stations such as TARGET LIST and DETAIL supports INLAND AIS in addition to SOLAS AIS, Class B AIS, base station, A to N and SAR. The screen is switched automatically according to the type of message received. For related information, see page AP6-6.

AP6.1.4 INLAND AIS

AP6.1.4.1 Switching to the INLAND AIS specification

1) Make sure that the software version is **Ver. 02.02 and after for FA-1501 and Ver. 02.01 and after for FA-1502** and the MOT board version is 24P0036-**33** and afetr.

2) From DIAGNOSTICS, open the ACTIVATE KEY menu and find the "DEVICE ID" code. Then, inform to Furuno for get the ACTIVATE KEY code.

3) Go to DIAGNOSTICS -> ACTIVATE KEY menu, and enter issued ACTIVATE KEY code in the KEY[ACTIVATED].
When the correct code is entered, the display shows "ACTIVATED" and the power is automatically rebooted.

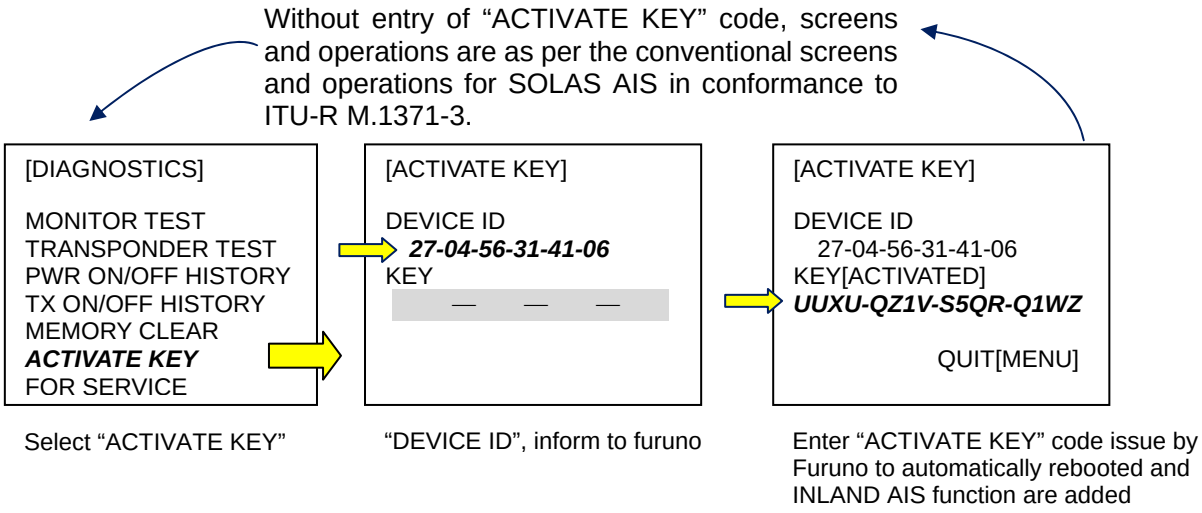


Figure AP6.1.2: Switching to the INLAND AIS specification

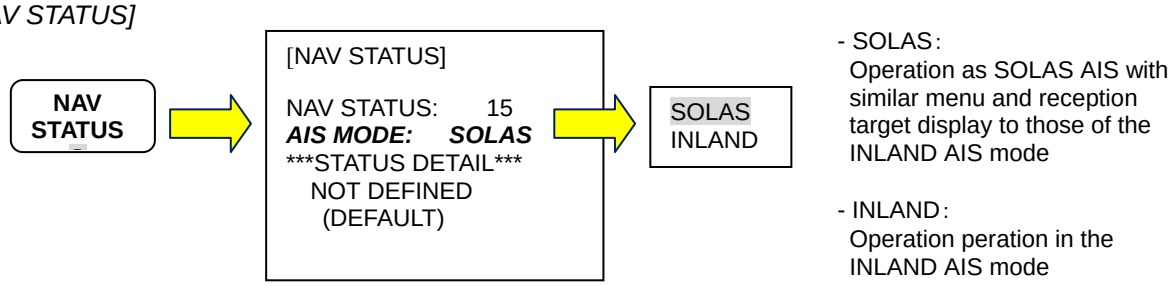
AP6.1.4.2 INLAND AIS specification

When the INLAND AIS specification has been enabled, the following additions are made as well as complay with ITU-R M.1371-3.

1. AIS MODE switching

Switching between INLAND AIS and SOLAS AIS modes can be done by using "AIS MODE" under the [NAV STATUS] menu. Select "INLAND" or "SOLAS AIS" according to the navigation area.
Setting to "SOLAS" activates the SOLAS AIS mode. The menu is similar to that of the INLAND AIS mode, except that messages in relation to INLAND AIS are not reported in the SOLAS AIS mode.

For AIS mode switching:
[NAV STATUS]



2. Sentences for INLAND AIS added

The function has been added to allow automatic and manual entry of dynamic and static data for INLAND AIS. For automatic entry (manual entry on the ECDIS), sentences for INLAND AIS are used. Those sentences are enabled when the INLAND AIS is "ACTIVATED."
The individual sentences are input/output data to/from a Navigation device such as ECDIS for INLAND navigation connected to FA-150 and not GPS or Marine Radar.
Connect the Navigation device for INLAND to COM 1 to 4 and setting the "EXT Display" mode. For the details of sentences, see page AP6-29.

Input Sentence

1) $PIWW IVD : Inland waterway voyage data
2) $PIWW SPW: Inland AIS security password
3) $PIWW SSD : Inland waterway static ship data
4) $PIWW VSD: Inland waterway voyage data

Output Sentence

1) $PIWW SPR: Inland AIS security password response
$PIWW SPR is a sentence to respond to $PIWW SPW.

3. Message handling

Messages used in INLAND AIS are MSG.1 to 24.
Navigational information, static information, etc. data of for INLAND AIS is transmitted as data embedded in the binary data of MSG.8 (Binary Broadcast Message) following the transmission of MSG.5. The transmission rate is the same as that of SOLAS AIS: basically, every 6 minutes.
The position report (dynamic information) is given via MSG.1, 2 and 3. With INLAND AIS, BLUE SIGN and REGIONAL BITS are added.

4. Display of received data

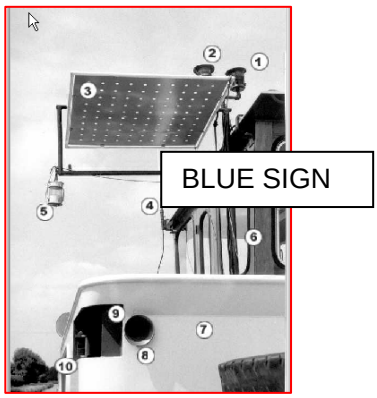
With the software Ver. 02.02 and after for FA-1501 and 02.01 and after for FA-1502, the display of data received from respective stations such as TARGET LIST and DETAILS supports INLAND AIS in addition to SOLAS AIS, Class B AIS, base stations, A to N and SAR. The screen is switched automatically according to the type of message received.
With INLAND AIS, switching takes place as switching from the display of SOLAS AIS received data to INLAND AIS received data when "200," which indicates an INLAND AIS message, is received as the DAC of Application Identifier included in MSG.6 and 8.
For example, following MSG.5 (static information) reported every 6 minutes, additional static information for INLAND AIS is reported via MSG.8 (Binary Broadcast Message). The DAC of this message is "200."
Accordingly, if this message is received from the station mentioned above, the display of SOLAS AIS received data switches to INLAND AIS received data.

Table AP6.1.3: TARGET LIST/DETAILS display switching recognition messages

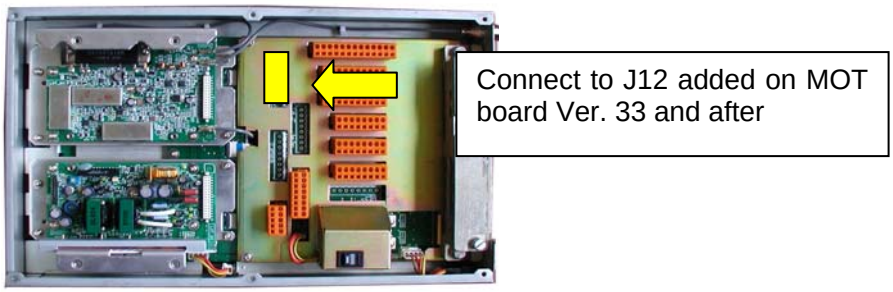
AIS Class	TARGET LIST/DETAILS display switching recognition message
SOLAS AIS	MSG.1, 2, 3, 5
Class B AIS	MSG.18, 19, 24
INLAND AIS	MSG. 6(DAC: 200), 8(DAC: 200)
A to N	MSG.21
BASE Station	MSG.24
SAR	MSG.9

5. Addition of BLUE SIGN

A BLUE SIGN refers to a board as shown below, which is displayed when the vessel is running in the reverse direction (on the left side). The signal from the BLUE SIGN is input to the AIS as a contact signal.
When this signal is activated, the status of the BLUE SIGN is reported via MSG.1.



1) BLUE SIGN contact signal connection
Connect the signal between MOT board (24P0024-33) J12-#4 and #5.



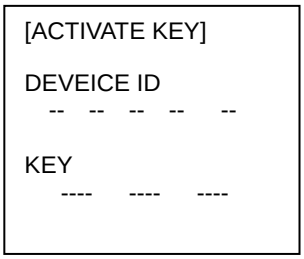
2) Setting
[MENU] -> INITIAL SETTINGS -> SET BLUE SIGN SW
- AVAILABLE :
  The contact signal is connected.
- NOT AVILABLE :
  The contact signal is not connected; if the BLUE SIGN data are included in the $PIWW VSD sentence from the device connected to AIS and input at a rate of 2 seconds or less, the status of the BLUE SIGN is reported via MSG.1.

3) Display
BLUE SIGN:
- YES (running on the left side)
- NO (running on the right side)
- --- (No signal: SET BLUE SIGN SW setting: NOT AVAILABLE)

The BLUE SIGN information from another vessel is shown in page 1/9 of [DETAILS SHIP]. The BLUE SIGN information of the own vessel is shown in page 2/2 of [DYNAMIC DATA].

AP6.1.5 INLAND AIS maintenance

1) If FA-1501 has the MOT board Ver. 24P0074-22 or lower, DIAGNOSTICS -> "ACTIVATE KEY" does not show "DEVICE ID" even if the software is updated with a new version. Only bars appear.



2) The DEVICE ID is stored on the MAIN board. The DEVICE ID changes if the MAIN board is replaced. ACTIVATE KEY code order to Furuno again.

3) The DEVICE ID is not erased by ALL CLEAR.
However, the ACTIVATE KEY code is erased. Enter the ACTIVATE KEY code again after ALL CLEAR.

AP6.2 INLAND AIS Settings

AP6.2.1 INITIAL SETTINGS

Configure the INITIAL SETTINGS menu item settings after switching to the INLAND AIS mode. To enter the INITIAL SETTINGS menu, the existing password must be entered.

Table 3.1.1: Initial Settings menu

Menu	Menu-1	Menu-2	Menu-3	Menu-4	Note
INITIAL SETTINGS	SET MMSI	MMSI			Same as SOLAS AIS mode
		NAME			
		C.SIN			
		IMO #			
		ENI			Added in INLAND AIS mode
	SET INT ANT POS.	A, B, C, D			Same as SOLAS AIS mode
	SET EXT ANT POS.	A, B, C, D			Same as SOLAS AIS mode
	SET SHIP TYPE	10 – 90 (Number of tens only) *Cargo type -> [NAV STATUS]*			Same as SOLAS AIS mode
	SET I/O PORT	SET COM PORT	COM 1	MODE and SPEED	Same as SOLAS AIS mode
			COM 2	MODE and SPEED	
			COM 3	MODE and SPEED	
			COM 4,	MODE and SPEED	
			COM 5	SENSOR SPEED	
			COM 6	SENSOR SPEED	
		SET PC PORT	MODE and SPEED		Same as SOLAS AIS mode
		SET LAN PORT	IP ADDRESS,		Same as SOLAS AIS mode *Note) Modified for NAVNET system FA-1501 Ver. 01.09 FA-1502 Ver. 01.07*
			SUBNET MASK,		
			NAVNET PORT NO.		
			GATEWAY ADDRESS		
			HOST NAME		
			AIS OUTPUT		
			GPS OUTPUT		
			ZDA OUTPUT		
		SET PRIORITY	L/L, COG, SOG	COM 4, 5, 6 -> 1, 2, 3	Same as SOLAS AIS mode
			HDG	COM 4, 5, 6 -> 2, 3, 1	
			ROT	COM 4, 5, 6 -> 2, 3, 1	
	SET QUALITY	SPEED	LOW/HIGH		Added in INLAND AIS mode
		COURSE	LOW/HIGH		
		HEADING	LOW/HIGH		
	SET BLUE SIGN SW	AVAILABLE NOT AVAILABLE			Added in INLAND AIS mode

The following describes the "INITIAL SETTINGS" items added in the INLAND AIS mode.

1. ENI code setting

SET MMSI menu

The ENI (Unique European Vessel Identification Number) codes are issued by the *National Inland Shipping Authorities* to vessels and set by the authorized engineer from Furuno at the time of installation the same way as MMSI.

The code consists of 7 digits: X_1 X_2 X_3 X_4 X_5 X_6 X_7.

X_1 X_2 X_3: base station number between 023 and 039

X_4 X_5 X_6 X_7: vessel-specific number

The ENI code is static information and reported via MSG.8 (DAC: 200, FI: 10) following MSG.5.

2. SET QUALITY

SET I/O PORT menu

Provides a menu for the information about the SPEED, COURSE and HEADING sensors to be connected.

- HIGH: sensor complay with type approval
- LOW: sensor not complay with type approval

SET QUALITY is static information and reported via MSG.8 (DAC: 200, FI: 10) following MSG.5. When the internal GPS is used, is it reported as "HIGH."

3. SET BLUE SIGN SW

SET I/O PORT menu

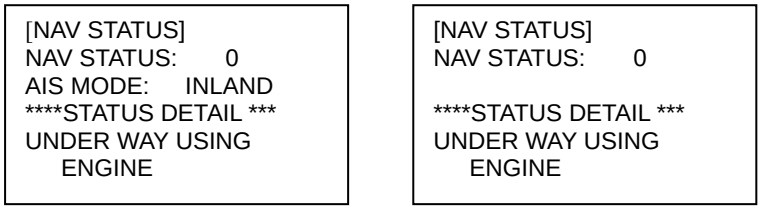
The SET BLUE SIGN signal is connected as a contact signal between the MOT board J12-#4 and 5. When this signal is connected, specify "AVAILABLE."

BLUE SIGN is dynamic information and reported in MSG.1, 2 and 3.

AP6.2.2 [NAV STATUS]

This section describes the [NAV STATUS] menu in the INLAND AIS mode.

1. NAV STATUS



SOLAS AIS screen

1) NAV STATUS

Same as SOLAS AIS mode.

This information is part of navigational information and reported via MSG.5. The setting range is between 0 and 15. The setting can be viewed by going to [DISP] -> STATIC DATA page 4 /9.

2) AIS MODE

Switch the mode between SOLAS and INLAND AIS mode according to the navigation area. When the mode has been switched, FA-150 reboots.

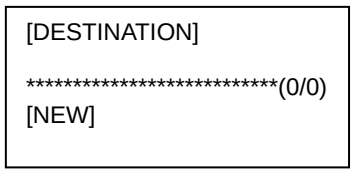
Select the AIS mode, "SOLAS" is for handling SOLAS AIS messages and INLAND for INLAND AIS messages. The menu structures are similar.

The settings can be viewed by going to [DISP] -> STATIC DATA page 1/9.

Note)

If the ACTIVATE KEY code is not input, the device operates as SOLAS AIS, which is the same as SOLAS AIS mode of the INLAND AIS specification except that the menu contents are different.

2. DESTINATION



SOLAS AIS screen and screen with INLAND AIS mode

Specifies the destination, as with the DESTINATION of SOLAS AIS.

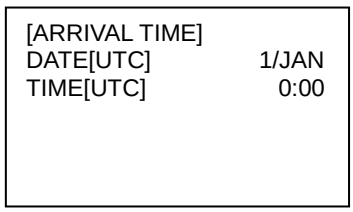
The setting can be viewed by going to [DISP] -> [STATIC DATA] 2/9 pages.

This information is part of navigational information and reported via MSG.5.

Hint)

Lock/bridge/terminal destinations can be set by going to [MSG] -> ETA/RTA -> CREATE MSG -> SET DESTINATION. The destinations set here such as a lock can be viewed by going to [DISP] -> [STATIC DATA] page 3/9.

3. ARRIVAL TIME



SOLAS AIS screen and screen with INLAND AIS mode

Specifies the time of arrival at the destination, as with the ARRIVAL TIME of SOLAS AIS.

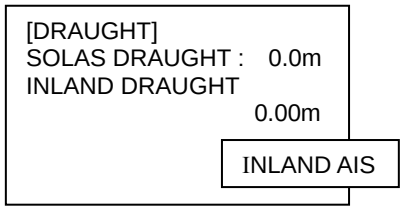
DATE /TIME

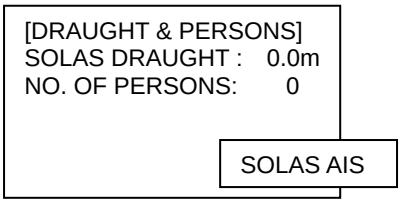
The settings can be viewed by going to [DISP] -> [STATIC DATA] 2/9 pages.
This information is part of navigational information and reported in MSG.5.

Hint)

Time of arrival at lock/bridge/terminal can be set by going to [MSG] -> ETA/RTA -> CREATE MSG -> ETA/RTA. The destinations set here such as a lock can be viewed by going to [DISP] -> [STATIC DATA] 3/9 page.

4. DRAUGHT





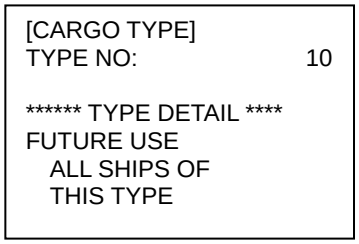
SOLAS AIS screen and screen with SOLAS mode of INLAND AIS specification

Specifies the draught.
Note that the unit of draught is different between SOLAS AIS and INLAND AIS:

- SOLAS DRAUGHT: 00.0 m
- INLAND DRAUGHT: 00.00 m

The setting can be viewed by going to [DISP] -> [STATIC DATA] page 6/9.
This information is part of navigational information and reported via MSG.5 in the SOLAS AIS.
The DRAUGHT in the INLAND AIS mode is reported via MSG.8 (DAC: 200, FI: 10) following MSG.5.

5. CARGO TYPE



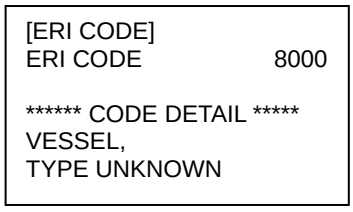
SOLAS AIS screen and screen with INLAND AIS mode

Same as the "SET SHIP TYPE" of SOLAS AIS.
Set the units digit with CARGO TYPE. Set the tenths digit with "SET SHIP TYPE" of the INITIAL SETTINGS. This is the same as the CARGO TYPE of SOLAS AIS.
The setting can be viewed by going to [DISP] -> [STATIC DATA] page 8/9.
ERI CODE is part of navigational information and reported via MSG.8 (DAC: 200, FI: 10) following MSG.5.

Hint)

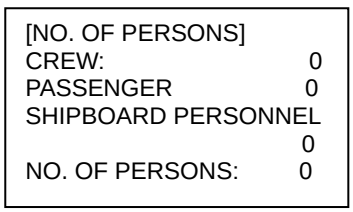
To set ERI CODE: Ship or combination type, go to [NAV] -> ERI CODE.

6. ERI CODE



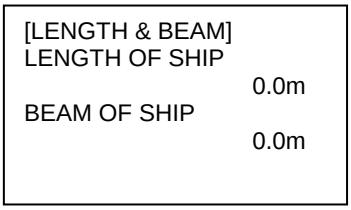
The ERI CODE: Ship or combination type that has been set can be viewed by going to [DISP] -> [STATIC DATA] page 9/9.
This information is part of navigational information and reported via MSG.8 (DAC: 200, FI: 10) following MSG.5.

7. NO. OF PERSONS



Set the CREW, PASSENGER, SHIPBOARD PERSONNEL and NO. OF PERSONS.
The total of the CREW, PASSENGER and SHIPBOARD PERSONNEL is the NO. OF PERSONS. The setting can be viewed by going to [DISP] -> [STATIC DATA] page 7/9. This information is edited by going to [MSG] -> NO. OF PERSONS -> CREATE MSG and sent manually. Or, the information is sent automatically when requested with IFM2 or IFM16. This information is reported via MSG.8 (DAC: 200, FI: 10).

8. LENGTH & BEAM

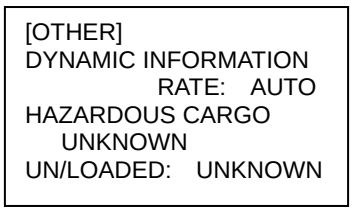


Set the length and beam of a ship. Enter a value not different by more than 3 m from the SET ANT POS. value specified by the INITIAL SETTINGS.
The setting can be viewed by going to [DISP] -> [STATIC DATA] page 6/9.
This information is part of navigational information and reported via MSG.8 (DAC: 200, FI: 10) following MSG.5.

Hint)

The size of a ship relates to SET INT(EXT) ANT POS., which can be accessed by going to [MENU] -> INITIAL SETTINGS -> SET INT(EXT) ANT POS.
Specifically, if the LENGTH value is different by more than 3 m from "A + B," which indicates ANT POS., an error message "DIFFERENT FROM ANT POS. VALUE" is displayed. However, the input data is accepted.
The same applies to the BEAM value and, if the difference from "C + D" is more than 3 m, a similar error message is displayed.

9. OTHER



1) DYNAMIC INFORMATION RATE:
AUTO/10SEC/5SEC/2SEC
Sets the rate of reporting of dynamic information. See the next page for the reporting rate.

Note)

In the SOLAS AIS MODE, this is only displayed not selectable.

2) HAZARDOUS CARGO:
NUMBER OF CONES 0/ NUMBER OF CONES 1/ NUMBER OF CONES 2 NUMBER OF CONES 3/B-FLAG/UNKNOWN
This can be viewed by going to [DISP] -> [STATIC DATA] page 5/9.
This information is part of navigational information and reported via MSG.8 (DAC: 200, FI: 10) following MSG.5.

3) UN/LOADED:
UNKNOWN/LOADED/UNLOADED
This can be viewed by going to [DISP] -> [STATIC DATA] page 4/9.
This information is part of navigational information and reported via MSG.8 (DAC: 200, FI: 10) following MSG.5.

AP6.3 INLAND AIS Handling

AP6.3.1 Dynamic information reporting rate

The rate of reporting of dynamic information is common to INLAND AIS and SOLAS AIS and depends on the vessel speed and change course.

Handling of dynamic information reporting rate

1) With INLAND AIS, the reporting rate can be manually changed.
   Set the rate with DYNAMIC INFORMATION RATE, which is accessible by going to [NAV STATUS] -> OTHER menu.
   -AUTO: Reported in accordance with the reporting rate by the vessel speed and change course shown in the table below
   -10SEC, 5SEC, 2SEC: Reported at the reporting rate selected.

   Note that the reporting rate assigned by MSG.23 takes precedence over a manually-set reporting rate (10, 5, 2SEC).
   When AUTO is specified, the reporting rate assigned by MSG.23 and the reporting rate based on the vessel speed are compared and the higher rate of the two takes precedence.
   Memo)
   The reporting rate assigned by MSG.23 is 2 seconds to 10 minutes.

2) The reporting rate can be specified based on the data from a navigation device such as ECDIS for INLAND navigation connected to FA-150.
   The sentence used is $PIWW IVD: Inland waterway voyage data, or $PIWW VDS.

Table AP6.3.1: Dynamic data reporting rate

Ship dynamic conditions	Nominal reporting interval
Ship status “at anchor” and not moving faster than 3 knots	3 minutes
Ship status “at anchor” and moving faster than 3 knots	10 seconds
Ship operating in SOLAS mode, moving 0 – 14 knots	10 seconds
Ship operating in SOLAS mode, moving 0 – 14 knots and changing course	3 1/3 seconds
Ship operating in SOLAS mode, moving 14 – 23 knots	6 seconds
Ship operating in SOLAS mode, moving 14 – 23 knots and changing course	2 seconds
Ship operating in SOLAS mode, moving faster 23 knots	2 seconds
Ship operating in SOLAS mode, moving faster 23 knots and changing course	2 seconds
Ship operating in inland waterway mode, moving	Assigned between 2 seconds and 10 seconds

AP6.3.2 Comparison of reported items between INLAND AIS and SOLAS AIS

1. Static ship information

Static information is automatically reported (broadcast) at a cycle of 6 minutes via MSG.5 and MSG.8 (DAC: 200, FI: 10) from a vessel or in response to a request.

Hint)

For the description of DAC and FI, see page AP6-20.

Information	SOLAS AIS	INLAND AIS
User Identifier (MMSI)	✔	✔
Name of Ship	✔	✔
Call Sign	✔	Amended for Inland AIS
IMO number	✔	Not available for Inland ships
Type of Ship and Cargo	✔	Amended for Inland AIS
Overall Length (decimeter accuracy)	✔	Amended for Inland AIS
Overall Beam (decimeter accuracy)	✔	Amended for Inland AIS
Unique European Vessel Identification Number (ENI)	Non	Inland AIS extension
Type of ship or combination (ERI)	Non	Inland AIS extension
Loaded/unloaded Vessel	Non	Inland AIS extension
Location of the in use position-fixing antenna on the ship (aft of bow and port or starboard of centerline)	✔	✔

2. Voyage related ship information

Voyage related information is reported (broadcast) via MSG.5 and MSG.8 (DAC: 200, FI: 10) when information has been changed, automatically from a vessel at a cycle of 6 minutes or in response to a request.

Information	SOLAS AIS	INLAND AIS
Destination (ERI location codes)	✔	✔
Category of dangerous cargo	✔	✔
Maximum present static Draught	✔	✔
ETA	✔	✔
Maximum present static Draught	✔	Amended for Inland AIS
Hazardous cargo classification	✔	Inland AIS extension

3. Dynamic ship information

Dynamic information is reported (broadcast) via MSG.1, 2 and 3, automatically from a vessel based on the vessel speed or change course or in response to a request. The cycle is between 2 seconds and 3 minutes.
The reporting rate assigned by MSG.23 can be used or the reporting rate can be changed manually. For related information, see page AP6-16.

Information	SOLAS AIS	INLAND AIS
Position (WGS 84)	✔	✔
Speed SOG (quality information)	✔	✔
Course COG (quality information)	✔	✔
Heading HDG (quality information)	✔	✔
Rate of turn ROT	✔	✔
Position accuracy (GNSS/DGNSS)	✔	✔
Time of el. position fixing device	✔	✔
Navigational status	✔	✔
Blue sign set	Non	Inland AIS extension/ regional bits in Standard IMO AIS
Quality of speed information	Non	Inland AIS extension (derived from ship sensor or GNSS)
Quality of course information	Non	Inland AIS extension (derived from ship sensor or GNSS)
Quality of heading information	Non	Inland AIS extension (derived from sensor)

4. ETA at lock/bridge/terminal

ETA at lock/bridge/terminal information (estimated time of arrival at lock/bridge/terminal arrival)
is reported via MSG.6 (DAC: 200, FI: 21) from a vessel to base stations on land.

Information	SOLAS AIS	INLAND AIS
Lock/bridge/terminal ID (UN/LOCODE)	Non	Inland AIS extension
ETA at lock/bridge/terminal	Non	Inland AIS extension
Number of assisting tugboats	Non	Inland AIS extension
Air draught	Non	Inland AIS extension

5. RTA at lock/bridge/terminal

RTA at lock/bridge/terminal information (requested time of arrival at lock/bridge/terminal) is reported via MSG.6 (DAC: 200, FI: 22) from base stations on land to a vessel.

Information	SOLAS AIS	INLAND AIS
Lock/bridge/terminal ID (UN/LOCODE)	Non	Inland AIS extension
RTA at lock/bridge/terminal	Non	Inland AIS extension

6. Number of persons on board

The number of persons on board is reported from a vessel to base stations on land via MSG.6 (DAC: 200, FI: 55) when requested by IFM2 or if there is any change. The information is sent by going to MSG -> NO. OF PERSONS -> CREATE MSG.

Information	SOLAS AIS	INLAND AIS
Total number of persons on board	Non	Inland AIS extension
Number of crew member on board	Non	Inland AIS extension
Number of passengers on board	Non	Inland AIS extension
Number of shipboard personnel on board	Non	Inland AIS extension

7. Signal status

The signal status information is reported (broadcast) from base stations to a vessel via MSG.8 (DAC: 200, FI: 40).

Information	SOLAS AIS	INLAND AIS
Signal Position (WGS84)	Non	Inland AIS extension
Signal Form	Non	Inland AIS extension
Light Status	Non	Inland AIS extension

8. EMMA warnings

The EMMA (European Multiservice Meteorological Awareness system) warnings information is reported (broadcast) from base stations on land to a vessel via MSG.8 (DAC: 200, FI: 23).

Information	SOLAS AIS	INLAND AIS
local weather warnings	Non	Inland AIS extension

9. Water levels

The water levels information is reported (broadcast) from base stations on land to a vessel via MSG.8 (DAC: 200, FI: 24).

Information	SOLAS AIS	INLAND AIS
local water level information	Non	Inland AIS extension

10. Short safety-related messages

MSG.14 safety-related messages.

Information	SOLAS AIS	INLAND AIS
safety-related messages	✔	✔

11. Traffic management information provided by the Inland AIS

Traffic management information is used in river navigation. This information is sent when requested, or in response to a request from a vessel sailing in a river or to a vessel.

AP6.3.3 INLAND AIS MSG.6 and 8

Messages used in the INLAND AIS mode are MSG.1 to 24.
Data characteristic of the INLAND mode are transmitted as data embedded in the binary data of MSG.6 and MSG.8.
The figure below shows MSG.6 and MSG.8 message structures. Whether a message is a SOLAS AIS or INLAND AIS message depends on the 16-bit Application ID field.
Ten bits of this Application ID field show the DAC (Designated Area Code). DAC "1" indicates SOLAS AIS and "200", INLAND AIS. The following 6 bits indicate a message defined by the FI (Functional Identifier).
With SOLAS AIS, the DAC and FI are defined as IFM (International Functional Message) and, with INLAND AIS, as RFM (Regional Function Message).

Note)

FI with DAC = 1 is IFM and with DAC ≠ 1 is RFM.

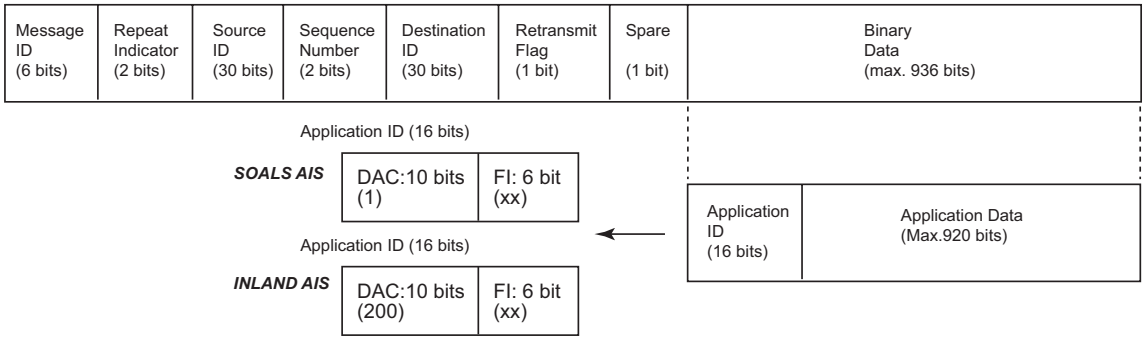


Figure AP6.3.1 MSG.6: Addressed Binary Message

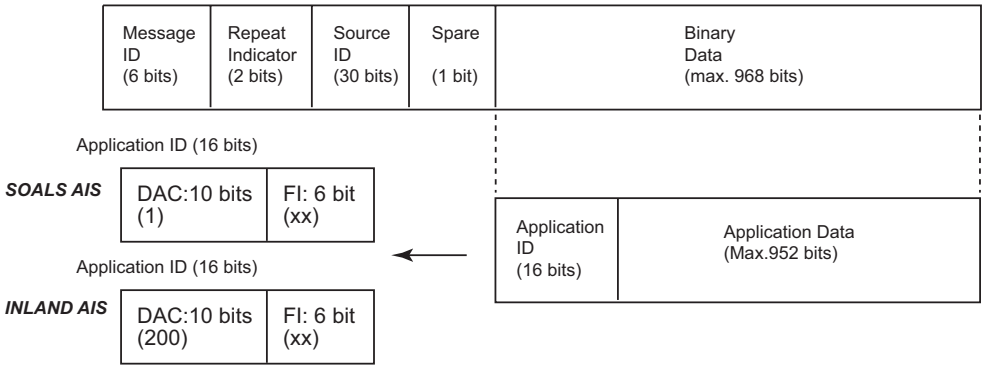


Figure AP6.3.2 MSG.8: Binary Broadcast Message

Table AP6.3.2: INLAND AIS FI types

MSG No.	FI	Name of MSG.	Sent by	Broadcast	Addressed
8	10	Gen: Inland ship static and voyage related data	Ship	X	
6	21	VTS: ETA at lock/bridge/terminal	Ship		X
6	22	VTS: RTA at lock/bridge/terminal	Shore		X
8	23	VTS: EMMA warning	Shore	X	
8	24	VTS: Water level	Shore	X	
8	40	A-to-N: Signal status	Shore	X	
8	55	SAR: Inland number of persons on board	Ship	X	X(preferably)

1. Inland specific message FI 10: Inland ship static and voyage related data

The message below is used in Inland AIS.

This message is additional static and navigational information-related message to MSG.5 and sent by broadcast. This message is sent via MSG.8 (DAC: 200, FI: 10) within 4 seconds after MSG.5 is sent.

Note)

The data for the shaded Bits are INLAND AIS binary data. The same applies to the tables that follow.

Table AP6.3.3: Inland vessel data report

Parameter	Bit	Description
Message ID	6	Identifier for Message 8; always 8
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. Default = 0; 3 = do not repeat any more
Source ID	30	MMSI number
Spare	2	Not used, should be set to zero. Reserved for future use.
Application Identifier	16	As described in Table AP6.2.2
Unique European Vessel Identification Number	48	8 digits *6 Bit ASCII characters
Length of ship	13	1 - 8000 (rest not to be used) length of ship in 1/10m 0 = default
Beam of ship	10	1 - 1000 (rest not to be used) beam of ship in 1/10m; 0 = default
Ship or combination type	14	Numeric ERI Classification (CODES): 1 Vessel and Convoy Type as described in ANNEX E ERI ship types
Hazardous cargo	3	Number of blue cones/lights 0 - 3; 4 = B-Flag, 5 = default = unknown
Draught	11	1 - 2000 (rest not used) draught in 1/100m, 0 = default = unknown
Loaded/unloaded	2	1 = loaded, 2 = unloaded, 0 = not available/default, 3 should not be used
Quality of speed information	1	1 = high, 0 = low/GNSS = default *
Quality of course information	1	1 = high, 0 = low/GNSS = default *
Quality of heading information	1	1 = high, 0 = low = default *
Spare	8	Not used, should be set to zero. Reserved for future use.
	168	Occupies 1 slot

* shall be set to 0 if no type approved sensor (e.g. gyro) is connected to the transponder

2.Inland specific message FI 21: ETA at lock/bridge/terminal

The message below is used in Inland AIS.

This message is provided for sending ETA (estimated time of arrival) information to a lock, bridge or terminal.

This message is sent manually by an operator on the vessel within 15 minutes via MSG.6 (DAC: 200, FI: 21).

If no reply is received within the specified time period, it can be rerequested by Inland AIS branch (extension) MSG.21 (FI=21) once only.

Table AP6.3.4 ETA report

Parameter	Bit	Description
Message ID	6	Identifier for Message 6; always 6
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. Default = 0; 3 = do not repeat any more
Source ID	30	MMSI number of source station Sequence Number 2 0 – 3
Destination ID	30	MMSI number of destination station[1]
Retransmit Flag	1	Retransmit Flag should be set upon retransmission: 0 = no retransmission = default; 1 = retransmitted.
Spare	1	Not used. Should be set to zero. Reserved for future use.
Application Identifier	16	as described in Table AP6.2.2
UN country code	12	2 digits *6 Bit characters
UN location code	18	3 digits *6 Bit characters
Fairway section number	30	5 digits *6 Bit characters
Terminal code	30	5 digits *6 Bit characters
Fairway hecto-metre	30	5 digits *6 Bit characters
ETA at lock/bridge/terminal	20	Estimated Time of Arrival; MMDDHHMM UTC Bits 19 - 16: month; 1 - 12; 0 = not available = default; Bits 15 - 11: day; 1 - 31; 0 = not available = default; Bits 10 - 6: hour; 0 - 23; 24 = not available = default; Bits 5 - 0: minute; 0 - 59; 60 = not available = default
Number of assisting tugboats	3	0- 6, 7 = unknown = default
Air draught	12	0 - 4000 (rest not used), in 1/100m, 0 = default = not used
Spare	5	Not used, should be set to zero. Reserved for future use.
	248	Occupies 2 slots

MMSI:

[1] a virtual MMSI number should be used for each country, each national AIS network should route messages addressed to other countries using this virtual MMSI number

3. Inland specific message FI 22: RTA at lock/bridge/terminal

This message is sent by base stations to a certain vessel as a response to FI21 for the purpose of assigning RTA (Requested Time of Arrival) at a lock, bridge or terminal.
This message is sent as a response message to Inland AIS branch (extension) MSG.21 (DAC: 200, FI: 21) via MSG.6 (DAC: 200, FI: 22).

Table AP6.3.5 RTA report

Parameter	Bit	Description
Message ID	6	Identifier for Message 6; always 6
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. Default = 0; 3 = do not repeat any more
Source ID	30	MMSI number of source station Sequence Number 2 0 - 3
Destination ID	30	MMSI number of destination station
Retransmit Flag	1	Retransmit Flag should be set upon retransmission: 0 = no retransmission = default; 1 = retransmitted.
Spare	1	Not used, should be set to zero. Reserved for future use.
Application Identifier	16	As described in Table AP6.2.2
UN country code	12	2*6 Bit characters
UN location code	18	3*6 Bit characters
Fairway section number	30	5*6 Bit characters
Terminal code	30	5*6 Bit characters
Fairway hectometre	30	5*6 Bit characters
RTA at lock/bridge/terminal	20	Recommended Time of Arrival; MMDDHHMM UTC Bits 19 - 16: month; 1 - 12; 0 = not available = default; Bits 15 - 11: day; 1 - 31; 0 = not available = default; Bits 10 - 6: hour; 0 - 23; 24 = not available = default; Bits 5 - 0: minute; 0 - 59; 60 = not available = default
Lock/bridge/terminal status	2	0 = operational 1 = limited operation (e.g. obstructed by technical conditions, only one lock chamber available, etc.) 2 = out of order 3 = not available
Spare	2	Not used, should be set to zero. Reserved for future use.
	232	occupies 2 slots

4. Inland specific message FI 55: number of persons on board

This message is sent by a vessel for the purpose of informing about the number of persons on board.

This message is sent at the time of an event (when a message is sent by going to MSG -> NO. OF PERSONS) and when requested by IFM2 and IFM16 via MSG.6 (DAC: 200, FI: 55).

Table AP6.3.6 Persons on board report

Parameter	Bit	Description
Message ID	6	Identifier for Message 6; always 6
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. Default = 0; 3 = do not repeat any more
Source ID	30	MMSI number of source station Sequence Number 2 0 – 3
Destination ID	30	MMSI number of destination station
Retransmit Flag	1	Retransmit Flag should be set upon retransmission: 0 = no retransmission = default; 1 = retransmitted.
Spare	1	Not used, should be set to zero. Reserved for future use.
Application Identifier	16	As described in Table AP6.2.2
Number of crew members on board	8	0 - 254 crew members, 255 = unknown = default
Number of passengers on board	13	0 - 8190 passengers, 8191 = unknown = default
Number of shipboard personnel on board	8	0 - 254 shipboard personnel, 255 = unknown = default
Spare	51	Not used, should be set to zero. Reserved for future use.
	168	Occupies 1 slot

5. Inland specific message FI23: EMMA warning

The EMMA (European Multiservice Meteorological Awareness system) is used to warn shippers of heavy weather conditions by indicating on the screen of an ECDIS for INLAND.

The message below can be received as EMMA data using the AIS channel. This message should be sent by base stations only, to give weather warnings to all vessels in a certain area.

This message is sent via MSG.8 (DAC 200, FI: 23) as required.

Table AP6.3.7 EMMA warning report

Parameter	Bit	Description
Message ID	6	Identifier for Message 8; always 8
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. Default = 0; 3 = do not repeat any more
Source ID	30	MMSI number
Spare	2	Not used, should be set to zero. Reserved for future use.
Application Identifier	16	As described in Table AP6.2.2
Start date	17	Start of validity period (YYYYMMDD), Bits 18-10: year since 2000 1-255; 0 = default) Bits 9-6: month (1-12; 0 = default) Bits 5-1: day (1-31; 0 = default)
End date	17	End of validity period (YYYYMMDD), Bits 18-10: year since 2000 1-255; 0 = default) Bits 9-6: month (1-12; 0 = default) Bits 5-1: day (1-31; 0 = default)
Start time	11	Start time of validity period (HHMM) UTC Bits 11-7: hour (0-23; 24 = default) Bits 6-1: minute (0-59; 60 = default)
End time	11	End time of validity period (HHMM) UTC Bits 11-7: hour (0-23; 24 = default) Bits 6-1: minute (0-59; 60 = default)
Start longitude	28	Begin of the fairway section
Start latitude	27	Begin of the fairway section
End longitude	28	End of the fairway section
End latitude	27	End of the fairway section
Type	4	type of weather warning: 0 = default/unknown, others see below table
Min value	9	Bit 0: 0 = positive, 1 = negative value = default Bits 1 - 8 = value (0 - 253; 254 = 254 or greater, 255 =unknown = default)
Max value	9	Bit 0: 0 = positive, 1 = negative value = default Bits 1 - 8 = value (0 - 253; 254 = 254 or greater, 255 = unknown = default)
Classification	2	classification of warning (0 = unknown/default, 1 = slight, 2 = medium, 3 = strong/heavy) according to below table
Wind direction	4	direction of wind: 0 = default/unknown, others see below table
Spare	6	not used, should be set to zero. Reserved for future use.
	256	occupies 2 slots

Weather_type_code		Weather_category_code		Wind_direction_code	
WI	Wind	1	Slight	N	north
RA	Rain	2	medium	NE	north east
SN	Snow and ice	3	strong	E	east
TH	Thunderstorm			SE	south east
FO	Fog			S	south
LT	Low temperature			SW	south west
HT	High temperature			W	west
FL	Flood			NW	north west
FI	Fire in the forests				

6. Inland specific message 24: water levels

This message should be used to allow the base station to inform skippers about actual water levels in their area. It is additional short-term information to the water levels distributed via Notices to Skippers.
The update rate shall be defined by base stations. It is possible to transmit the water levels of more than 4 gauges using multiple messages. This message should be sent by base stations to give water level information to all vessels in a certain area.
The message is sent via MSG.8 (DAC: 200, FI: 24) at regular intervals.

Table AP6.3.8 Water level report

Parameter	Bit	Description
Message ID	6	Identifier for Message 8; always 8
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. Default = 0; 3 = do not repeat any more
Sourc e ID	30	MMSI number
Spare	2	Not used, should be set to zero. Reserved for future use.
Application Identifier	16	As described in Table AP6.2.2
UN country code	12	UN country code using 2 digits *6-Bit ASCII characters according to ERI specification
Gauge ID	11	National unique ID of gauge 1-2047, 0 = default = unknown
Water level	14	Bit 0: 0 = negative value, 1 = positive value Bits 1-11: 1-8191, in 1/100m, 0 = unknown = default
Gauge ID	11	National unique ID of gauge 1-2047, 0 = default = unknown
Water level	14	Bit 0: 0 = negative value, 1 = positive value Bits 1-11: 1-8191, in 1/100m, 0 = unknown = default
Gauge ID	11	National unique ID of gauge 1-2047, 0 = default = unknown
Water level	14	Bit 0: 0 = negative value, 1 = positive value Bits 1-11: 1-8191, in 1/100m, 0 = unknown = default
Gauge ID	11	National unique ID of gauge 1-2047, 0 = default = unknown
Water level	14	Bit 0: 0 = negative value, 1 = positive value Bits 1-11: 1-8191, in 1/100m, 0 = unknown = default
	168	occupies 1 slot

7. Inland specific message 40: signal status

This message should be sent by base stations to inform about the status of different light signals in a certain area.
The information should be displayed on an external Inland ECDIS display as dynamic symbols.
The message is sent via MSG.8 (DAC: 200, FI: 40) at regular intervals.

Table AP6.3.9 Signal status report

Parameter	Bit	Description
Message ID	6	Identifier for Message 8; always 8
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. Default = 0; 3 = do not repeat any more
Source ID	30	MMSI number
Spare	2	Not used, should be set to zero. Reserved for future use.
Application Identifier	16	As described in Table AP6.2.2
Signal position longitude	28	Longitude in 1/10 000 min (±180 degrees, East = positive, West= negative. 181 degrees (6791AC0 hex) = not available = default)
Signal position latitude	27	Latitude in 1/10 000 min (±90 degrees, North = positive, South =negative, 91 degrees (3412140 hex) = not available = default)
Signal form	4	0,15 = unknown = default, 1-14 signal form according to
Orientation of signal	9	Degrees (0-359) (511 indicates not available = default).
Direction of impact	3	1 = upstream, 2 = downstream, 3 = to the left bank, 4 = to the right bank, 0 = unknown = default, rest not used
Light status	30	Status (1 to 7) of up to 9 lights (light 1 to light 9 from left to right, 100000000 means colour 1 at light 1) per signal. 000000000 = default, 777777777 maximum, rest not used
Spare	11	Not used, should be set to zero. Reserved for future use.
	168	occupies 1 slot

8 Message 1, 2, 3: position reports

MSG.1, 2 and 3 are different between SOLAS AIS and INLAND AIS. To INLAND AIS messages, Blue sign and Regional Bits are added.

Table AP6.3.9 Message 1, 2, 3: position reports

Parameter	BIT	Description
Message ID	6	Identifier for this message 1, 2 or 3
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. Default = 0; 3 = do not repeat any more
User ID (MMSI)	30	MMSI number
Navigational Status	4 ;	0 = under way using engine; 1 = at anchor; 2 = not under command; 3 = restricted manoeuvrability; 4 = constrained by her draught; 5 = moored; 6 = aground; 7 = engaged in fishing; 8 = under way using engine 9 = reserved for future amendment of Navigational Status for HSC; 10 = reserved for future amendment of Navigational Status for WIG; 11 - 14 = reserved for future use; 15 = not defined = default
Rate of Turn ROTAIS	8	±127 (–128 (80 hex) indicates not available, which should be the default). Coded by ROTAIS=4.733 SQRT(ROTINDICATED) degrees/min ROTINDICATED is the Rate of Turn (720 degrees per minute), as indicated by an external sensor. +127 = turning right at 720 degrees per minute or higher; –127 = turning left at 720 degrees per minute or higher.
Speed over Ground	10	Speed over ground in 1/10 knot steps (0-102.2 knots) 1023 = not available; 1022 = 102.2 knots or higher *1
Position Accuracy	1	1 = high (< 10 m; Differential Mode of e.g. DGNSS receiver) 0 = low (> 10 m; Autonomous Mode of e.g. GNSS receiver or of other Electronic Position Fixing Device) ; default = 0
Longitude	28	Longitude in 1/10 000 min (±180 degrees, East = positive, West = negative. 181 degrees (6791AC0 hex) = not available = default)
Latitude	27	Latitude in 1/10 000 min (±90 degrees, North = positive, South = negative, 91 degrees (3412140 hex) = not available = default)
Course over Ground	12	Course over ground in 1/10° (0-3599). 3600 (E10 hex) = not available = default; 3601 – 4095 should not be used.
True Heading	9	Degrees (0-359) (511 indicates not available = default).
Time Stamp	6	UTC second when the report was generated (0-59, or 60 if time stamp is not available, which should also be the default value, or 62 if Electronic Position Fixing System operates in estimated(dead reckoning) mode, or 61 if positioning system is in manual input mode or 63 if the positioning system is inoperative).
Blue sign	2	Indication if blue sign is set 0 = not available = default, 1 = no 2 = yes, 3 = not used *2
Regional Bits	2	Reserved for definition by a competent regional authority. Should be set to zero, if not used for any regional application. Regional applications should not use zero.
Spare	1	Not used. Should be set to zero. Reserved for future use
RAIM Flag	1	RAIM (Receiver Autonomous Integrity Monitoring) flag of Electronic Position Fixing Device; 0 = RAIM not in use = default; 1 = RAIM in use)
Communication State	19	See ITU-R M. 1371-1 table 15B
	168	Occupies 1 slot

*1 knots should be calculated in km/h by external onboard equipment
*2 should only be evaluated if the report is coming from an Inland AIS vessel and if the information is derived by automatic means (direct connection to switch),

AP6.4 Sentences Added for INLAND AIS

When the ACTIVE KEY code has been input to have the INLAND AIS function "ACTIVATED," sentences added for INLAND AIS are accepted. In other words, the sentences are accepted regardless of whether the AIS MODE setting on [NAV STATUS] is "INLAND" or "SOLAS."
When the "ACTIVE KEY" code has not been input, or with the conventional SOLAS AIS, respective sentences for the INLAND AIS are ignored.

AP6.4.1 Input Sentence

1. PIWW IVD: Inland waterway voyage data

This sentence is used to enter navigational information such as Reporting rate, Number of blue cones, Loaded/unloaded, Inland draught and Air draught of voyage data.
If this sentence does not exist in the INLAND AIS mode, it should be set manually in the [NAV STATUS] menu.

$PIWWIVD,x,x,x,xx.xx,xx.xx,x,xxx,xxxx,xxx*hh<CR><LF>
1 2 3 4 5 6 7 8 9

No.	Function	Note
1	reporting rate	Reporting rate settings, default setting: 0
2	hazardous cargo	number of blue cones: 0-3, 4=B-Flag, 5=default=unknown
3	Loaded/unloaded	0=not available=default, 1=loaded, 2=unloaded, rest not used
4	draught	static draught of ship 0 to 20.00m, 0=unknown=default, rest not used
5	air draught	air draught of ship 0 to 40.00m, 0=unknown=default, rest not used
6	number of assisting tug boats	number of assisting tugboat 0-6, 7=default=unknown, rest not used
7	number of crew members	number of crew members on board 0 to 254, 255=unknown=default, rest not used
8	number of passengers	number of passengers on board 0 to 8190, 8191=unknown=default, rest not used
9	number of shipboard personnel	NOTE 9 number of shipboard personnel on board 0 to 254, 255=unknown=default, rest not used

2. $PIWW SSD: Inland waterway static ship data

This sentence provides the own vessel data including the ENI (Unique European Vessel Identification Number), ERI (Electronic Reporting International) ship type, Length, Beam and Speed/Course/Heading information accuracy. If this sentence does not exist, it should be manually set with SET QUALITY of SET I/O PORT in the INITIAL SETTING menu.

$PIWWSSD,cccccccc,xxxx,xxx.x,xxx.x,x,x,x*hh<CR><LF>
1 2 3 4 5 6 7

No.	Function	Note
1	ENI	
2	type of ship	ERI ship type according to ERI classification
3	length of ship	length of ship 0 to 800,0 meter
4	beam of ship	beam of ship 0 to 100,0 meter
5	quality of speed information	quality of speed information 1=high or 0=low
6	quality of course information	quality of course information 1=high or 0=low
7	quality of heading information	quality of heading information 1=high or 0=low

3. $PIWW SPW: Inland AIS security password

This provides a password for changing the ENI (Unique European Vessel Identification Number). Following this sentence, change the ENI by using $PIWW SSD sentence. As the password, “652111” is pre-defined.

$PIWWSPW,a,x,c--c,x.x*hh<cr><lf>
1 2 3 4

No.	Function	Note
1	Functional mode	Function mode of the password E = Enter password, C = Change password
2	Password level	Password level. This field is used to supply different password levels, like Administrator or Operator password 1 = Administrator or installation password 2 = Operator password
3	Password	In case of entering a password this is the password used for authentication. The password has to match the password stored in the equipment for the security level as defined by field 2. In case of changing a password this is the new password. An Inland AIS security password sentence with a valid password for the same or higher level indicated in field 2 (lower number in field 2) must be received before.
4	Validity time	Indicates the validity time-out in seconds, range 0 to 60 seconds. When this time has elapsed a new SPW sentence is required for configuration. “0” = “valid for only one following sentence within next 60 seconds”

4. $PIWW VSD: Inland waterway voyage data

This sentence is used to enter navigational information such as Reporting rate, Blue sign and Number of shipboard personnel of voyage data. If this sentence does not exist in the INLAND AIS mode, it should be set manually in the [NAV STATUS] menu.

$PIWWVSD,x,x,x,x,xx.xx,xx.xx,x,xxx,xxxx,xxx*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10

No.	Function	Note
1	reporting rate	0=not available=default=factory settings, 1=SOLAS settings, 2=Inland Waterway settings (2 sec), rest not used
2	blue sign	0=not available=default, 1=not set, 2=set, rest not used
3	hazardous cargo 3	number of blue cones: 0-3, 4=B-Flag, 5=default=unknown
4	Loaded/unloaded	0=not available=default, 1=loaded, 2=unloaded, rest not used
5	draught	static draught of ship 0 to 20,00m, 0=unknown=default, rest not used
6	air draught	air draught of ship 0 to 40,00m, 0=unknown=default, rest not used
7	number of assisting tug boats	number of assisting tugboat 0-6, 7=default=unknown, rest not used
8	number of crew members	number of crew members on board 0 to 254, 255=unknown=default, rest not used
9	number of passengers	number of passengers on board 0 to 8190, 8191=unknown=default, rest not used
10	number of shipboard personnel	number of shipboard personnel on board 0 to 254, 255=unknown=default, rest not used

AP6.4.2 Output Sentence

1. $PIWW SPR: Inland AIS security password response

$PIWW SPR is a sentence to respond to $PIWW SPW.

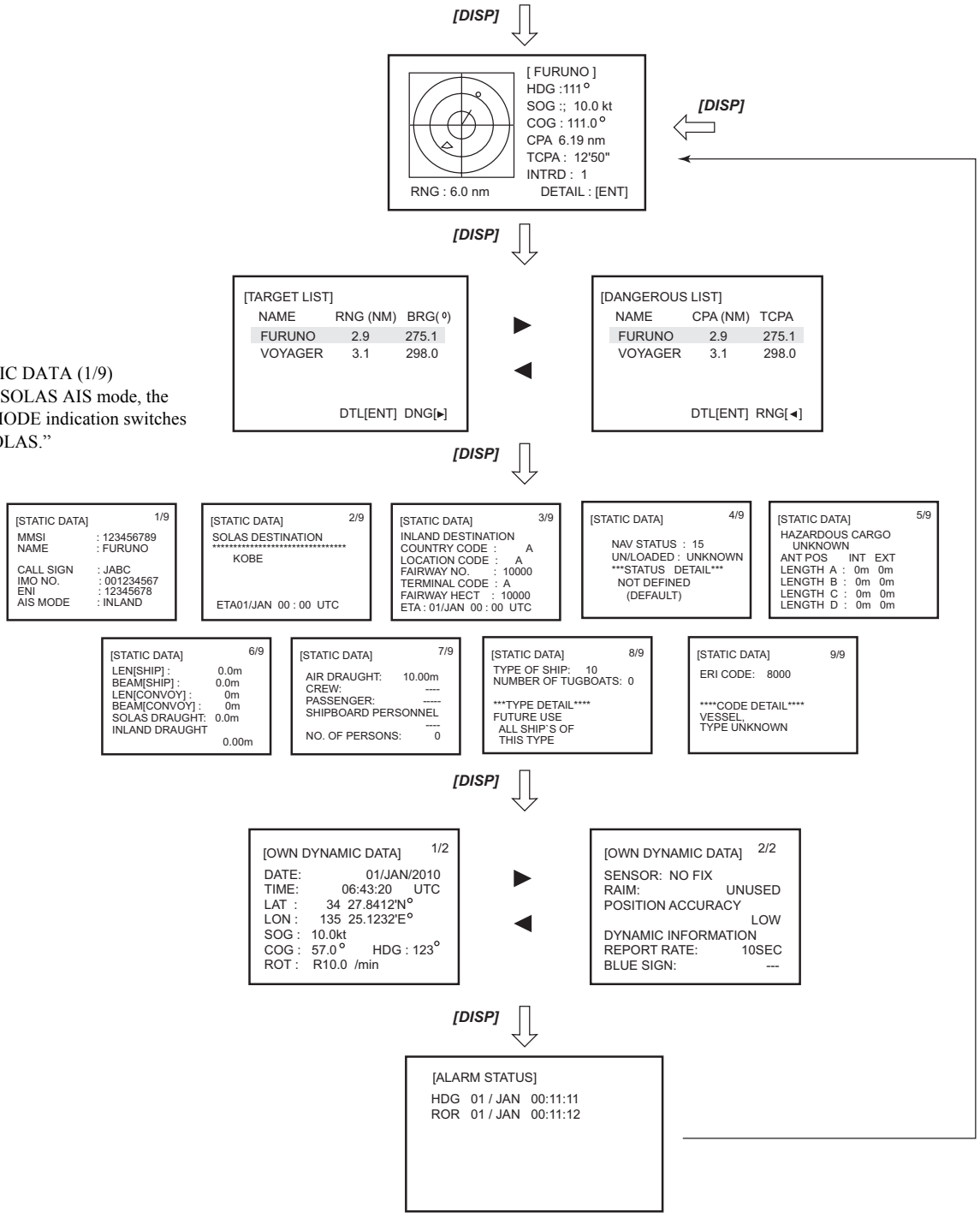
$PIWWSPR,a,x,x.x,x*hh<cr><lf>
1 2 3 4

No.	Function	Note
1	Functional mode	Function mode of the PIWWSPW sentence being reported on. E = Status for enter password C = Status for change password
2	Password level	Password level of the PIWWSPW sentence being reported on.
3	Validity time	Validity time-out of the PIWWSPW sentence being reported on.
4	Password status	Password status. 0 = operation was successful 1 = operation failed

AP6.5 Menu Tree

AP6.5.1 [DISP]

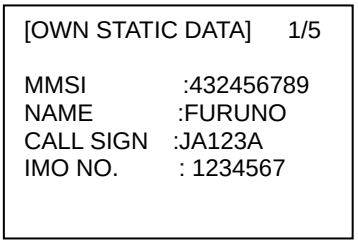
In the INLAND AIS mode, the screen display is switched every time the [DISP] key is pressed. Select a target on the reception target list and press the [ENT] key to show the detailed data.

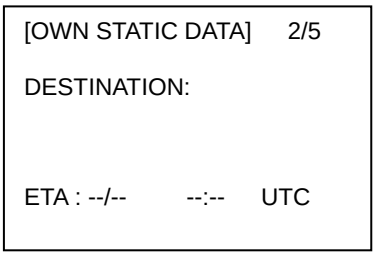


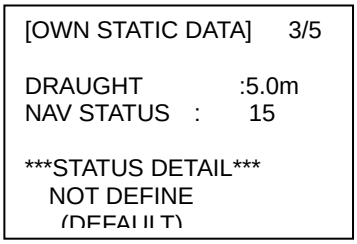
Note)
STATIC DATA (1/9)
In the SOLAS AIS mode, the AIS MODE indication switches to "SOLAS."

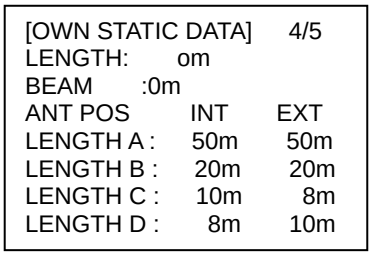
Reference:

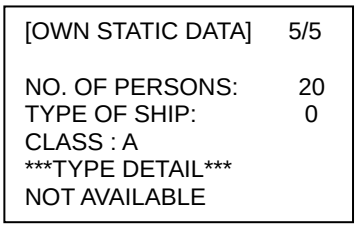
Conventional SOLAS AIS [DISP] screen displays





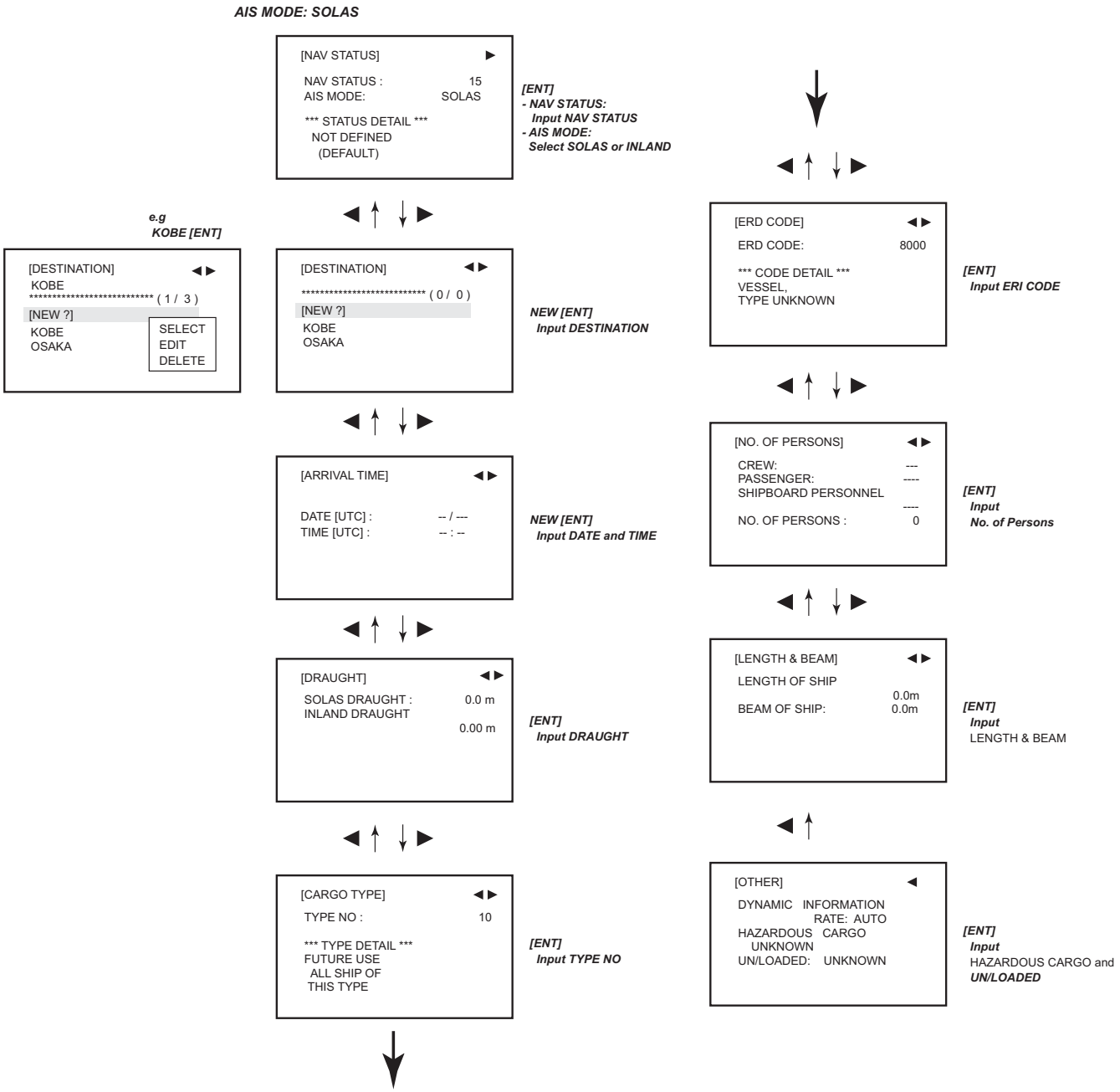






AP6.5.2 [NAV STATUS]

In the INLAND AIS mode, press the [NAV STATUS] key to configure the NAV STATUS, DESTINATION, ARRIVAL TIME, CARGO TYPE & CREW and DRAUGHT settings. The settings should be configured by the user when any change is made to this information.



AP6.5.3 [MENU]: AIS MODE -> INLAND AIS and SOLAS AIS

[MENU]	Menu-1	Menu-2	Menu-3	Menu-4	Menu-5	Note
MSG *Cont'd*	TEXT	CREATE MSG	SET MSG TYPE	ADRS TYPE	BROAD CAST/ADRS CAST	
				MMSI	---------	
				MSG TYPE	SAFETY/NORMAL	
				CHANNEL	ALTERNATE/BOTH A & B/A/B	
				RETRY TIMES	0 ----- 9 (3:default)	When set to ADRS CAST only
			SET MSG	e.g: DE FURUNO		- ADRS CAST SAFETY: 85 character 85 NORMAL: 80 character 80 - BROAD CAST SAFETY: 90 character 90 NORMAL: 86 character 86
				SEND MESSAGE.		[ARE YOU SURE? YES/NO]
			SEND MSG			
		TX LOG	Date/Time/OK or FAIL/TO		*Sent Message appears*	Max.20
		RX LOG	Date/Time/OK or FAIL/TO		*Received Message appears*	Max.20
	ETA/RTA *Cont'd*	CREATE MSG *Cont'd*	SET MSG TYPE	MMSI	---------	
				CHANNEL	ALTERNATE/BOTH A & B/A/B	
				RETRY TIMES	0 ----- 9 (1:default)	
			SET DESTINATION	COUNTRY CODE	Input 2 characters	
				LOCATION CODE	Input 3 characters	
				FAIRWAY NO.	Input 5 digits	
				TERMINAL CODE	Input 5 characters	
				FAIRWAY HECT	Input 5 digits	

MSG	ETA/RTA	CREATE MSG	SET ETA	ETA DATE(UTC)	--: --	
				ETA TIME(UTC)	--:--	
				AIR DRAUGHT	0.00m	
				NO. OF TUGBOATS	0 - 9	
			SEND MSG	ADRS TYPE	BROAD CAST/ADRS CAST	
		ETA LOG				Max.20
		RTA LOG				Max.20
	NO. OF PERSONS	CREATE MSG	SET MSG TYPE	ADRS TYPE	BROAD CAST/ADRS CAST	
				MMSI	---------	
				TYPE	SOLAS(IFM16) INLAND(FRM55)	*SOLAS MODE: Fixed SOLAS(IFM16)*
				CHANNEL	ALTERNATE/ BOTH A & B/A/B	
				RETRY TIMES	0 ----- 9 (3:default)	
			VIEW MSG	INLAND MSG(RFM55)		
				CREW		
				PASSENGER		
				SHIPBOARD PERSONNEL		
				SOLAS MSG(IFM116)		
				NO. OF PERSONS		
			SEND MSG			
		TX LOG	Date/Time/OK or FAIL/TO			Max.20
	EMMA WARNING					
	WATER LEVEL					

[MENU]	Menu-1	Menu-2	Menu-3	Menu-4	Menu-5	Note
SENSOR STATUS	e.g: EXTRL DGNSS EXTRL SOG/COG HDT VALID OTHER ROT					
INTERNAL GPS	LAT: xx° xx. xxxx'x LON: xxx° xx. xxxx'x S/C: 0.0 - 999.9 kn/ 0.0 - 359.0° UTC: dd:mmm:yyyy hh:mm:ss STS: DGPS/ NO FIX/2D/3D/D2D/ D3D/DOP/NO FIX PA: H/L RAIM: USED/UNUSED					

[MENU]	Menu-1	Menu-2	Menu-3	Menu-4	Note
USER SETTINGS	KEY BEEP	ON/OFF			
	ALARM BUZZER	ON/OFF			
	DISP RCVD MSG	ALL/ABM/OFF			
	RCVD MSG BUZZ	ON/OFF			
	LR MODE	AUTO/MANUAL			
	AUTRO SORT	ON/OFF			
	CPA/TCPA ALAM	CPA	6.00 nm (0 – 6 nm)		
		TCPA	60 min (0 – 60 min)		
		ALARM MODE	ON/OFF		
		ALARM BUZZER	ON/OFF		
INITIAL SETTINGS *Cont'd*	VIEW MMSI	MMSI: NAME: C.SIN: IMO NO: ENI:			*ENI:* *Added in INLAND AIS*
	VIEW INT ANT POS.	A (0-511m)/B (0-511m) C (0-63m)/D (0-63m)			
	VIEW EXT ANT POS.	A (0-511m)/B (0-511m) C (0-63m)/D (0-63m)			
	VIEW SHIP TYPE	TYPE NO: x*			
	VIEW I/O PORT *Cont'd*	VIEW COM PORT *Cont'd*	[VIEW COM1] MODE: LONG RANGE SPEED: IEC61162-2		
			[VIEW COM2] MODE: EXT DISPLAY SPEED: IEC61162-2		
			[VIEW COM3] MODE: EXT DISPLAY SPEED: IEC61162-2		

INITIAL SETTINGS	VIEW I/O PORT	VIEW COM PORT	[VIEW COM4] MODE: SENSOR SPEED: IEC61162-1		
			[VIEW COM5] MODE: SENSOR SPEED: IEC61162-1		
			[VIEW COM6] MODE: SENSOR SPEED: IEC61162-1		
		VIEW PC PORT	MODE: STANDARD SPEED: 38.4KBPS		
		VIEW LAN PORT	MODE: DISABLE IP ADDRESS: 172.031.024.001 SUB NET MASK: 255.255.000.000 PORT NO.: 10000 GATEWAY ADDRESS: 000.000.000.000 HOST NAME: AIS0 - 9 AISOUTPUT: AUTO/CONTINUOUS GPSOUTPUT: AUTO/CONTINUOUS ZDAOUTPUT: AUTO/CONTINUOUS		*Modified for NAVNET system* *FA-1501 Ver. 01.9 and after* *FA-1502 Ver01.07 and after*
		VIEW PRIORITY	L/L, COG, SOG	COM4: 1 / COM5: 2 / COM6: 3	
			HDG	COM4: 2 / COM5: 3 / COM6: 1	
			ROT	COM4: 2 / COM5: 3 / COM6: 1	
		VIEW QUALITY	SPEED	LOW	*For INLAND AIS*
			COURSE	LOW	
			HEADING	LOW	
	VIEW BLUE SIGN SW	BLUE SIGN SW NOT AVAILABLE			*For INLAND AIS*

[MENU]	Menu-1	Menu-2	Menu-3	Menu-4	Note
INITIAL SETTINGS *Password:* *[MENU] ->* *[ENT] ->* *[DISP] ->* *[DIM] ->* *[NAV] ->* *[MENU]* *Cont'd*	SET MMSI	MMSI: X_1 ---- X_9 NAME: Max. 20 character C.SIN: Max. 7 character IMO NO: X_1 ---- X_9 ENI: X_1 ---- X_8			*ENI:* *Added in INLAND AIS*
	SET INT ANT POS.	A (0-511m)/B (0-511m) C (0-63m)/D (0-63m)			
	SET EXT ANT POS.	A (0-511m)/B (0-511m) C (0-63m)/D (0-63m)			
	SET SHIP TYPE	TYPE NO: x*			
	SET I/O PORT *Cont'd*	SET COM PORT *Cont'd*	SET COM1	MODE: LONG RANGE/EXT DISPLAY/ DISABLE	
				SPEED: IEC61162-1/IEC61162-2	
			SET COM2	MODE: EXT DISPLAY/MONITOR HI LEVEL IF/DISABLE	
				SPEED: IEC61162-1/IEC61162-2	
			SET COM3	MODE: EXT DISPLAY/MONITOR HI LEVEL IF/DISABLE	
				SPEED: IEC61162-1/IEC61162-2	
			SET COM4	MODE: SENSOR/EXT DISPLAY DISABLE	
				SPEED: IEC61162-1/EC61162-2	

INITIAL SETTINGS	SET I/O PORT	SET COM PORT	SET COM5	MODE: ENSOR	
				SPEED:IEC61162-1/IEC61162-2	
			SET COM6	MODE: SENSOR	
				SPEED:IEC61162-1/IEC61162-2/AD-10	
		SET PC PORT		MODE: STANDERD/MONITOR/SERVICE/ BEACON/DISABLE	
				SPEED: 4800/9600/19.2KBPS/38.4KBPS/ 57.6KBPS	
		SET LAN PORT		IP ADDRESS: 172.031.024.001 UB NET MASK: 255.255.000.000 PORT NO. : 10000 GATEWAY ADDRESS: 000.000.000.000 HOST NAME: AIS0 - 9 AISOUTPUT: AUTO/CONTINUOUS GPSOUTPUT: AUTO/CONTINUOUS ZDAOUTPUT: AUTO/CONTINUOUS	*Modified for NAVNET system* *FA-1501 Ver. 01.9 and after* *FA-1502 Ver01.07 and after*
		SET PRIORITY	L/L, COG, SOG	L/L, COG, SOG COM4: 1, 2, 3 / COM5: 1, 2, 3 COM6: 1, 2, 3	
			HDG	HDG COM4: 1, 2, 3 / COM5: 1, 2, 3 COM6: 1, 2, 3	
			ROT	ROT COM4: 1, 2, 3 / COM5: 1, 2, 3 COM6: 1, 2, 3	
		SET QUALITY	SPEED	LOW/HIGH	*For INLAND AIS*
			COURSE	LOW/HIGH	
			HEADING	LOW/HIGH	
	SET BLUE SIGN SW	NOT AVAILABLE/ AVAILABLE			*For INLAND AIS*

[MENU]	Menu-1	Menu-2	Menu-3	Menu-4	Note
CHANNEL SETTINGS	VIEW CHANNEL	[VIEW CHANNEL] POWER : 1W/12.5W CHANNEL NO. : CH-A: 2087 CH-B: 2088			
	EDIT CHANNEL	[CHANNEL EDIT] SELECT NO. (0) TIME dd/mmm hh:mm FROM MMSI: --------- TYPE: HIGH SEA/AIS/PI/ DSC/MANUAL ***Note:*** No.0: For Edit Channel No.1: Current Channel No.2 – 9: Edited Channel	[CHANNEL EDIT] 1/2 FROM MMSI: ---------- POWER: 1W/12.5W CH NO.: CH-A: 2087 CH-B: 2088 MODE CH-A: TX/RX, RX, UNUSED CH-B: TX/RX, RX, UNUSED ZONE: 5 nm (1-8nm) [CHANNEL EDIT] 2/2 CH AREA RIGHT TOP LAT: 0° 00.0'N/S LON: 0° 00.0'E/W LEFT BOTTOM LAT: 0° 00.0'N/S LON: 0° 00.0'E/W		

[MENU]	Menu-1	Menu-2	Menu-3	Menu-4	Note
DIA-GNOSTICS	MONITOR TEST	BOOT NO. : 2450020-02.0x PROG NO. : 2450021-02.0x ROM : OK CONT : xx SDRAM : OK DIM : x PORT : OK KEY :			
	TRANSPONDER TEST	MEMORY TEST	PROGRAM NO. 2450018-02.0x MAIN ROM : OK/NG MAIN RAM : OK/NG SUB RAM : OK/NG MOT HW: 1		*MOT HW* *1: MOT board Ver. 24P0036-33* *0: MOT board Ver. 24P0036-22*
		GPS TEST	PROGRAM NO. 4850264005 TEST : OK/NG (NG List)		
	PWR ON/OFF HISTORY	PWR-ON dd/mm/yyyy Time PWR-OFF dd/mm/yyyy Time			
	TX ON/OFF HISTORY	TX-ON dd/mm/yyyy Time TX-OFF dd/mm/yyyy Time			
	MEMORY CLEAR	MONITOR CLEAR SET USER DEFAULT GPS COLD START	ARE YOU SURE? YES NO		
	ACTIVATE KEY	DEVICE ID	xx-xx-xx-xx-xx-xx		*Added:* *FA-1501 Ver. 02.02 and after* *FA-1502 Ver02.01 and after*
		KEY[ACTIVATED]	xxxx-xxxx-xxxx-xxxx		

[MENU]	Menu-1	Menu-2	Menu-3	Menu-4	Note
FOR SERVICE *Cont'd*	Password: *Up key -> Down key ->Left key -> Right key -> NAV -> DIM -> DISP -> ENT -> MENU -> NAV* *Cont'd*	CH & PWR SETTINGS	POWER : 0W/1W/2W/12.5W CH NO. CH-A : xxxx CH-B : xxxx MODE:CH-A: TX/RX//RX//UNUSED CH-B: TX/RX//RX//UNUSED CH SET : AUTO/MANUAL		
		TX TEST	PATTERN: TX START [DIM] TX STOP [MENU]	PN_PATTERN/ TYPE 1/TYPE 2/ DSC 1[Y]/DSC 2[B]/ DSC3[BY]/TXF	
		RX TEST	RX1 : OK/NG RX2 : OK/NG DSC : OK/NG		
		I/O PORT TEST	IEC PORT TEST	COM1: OK/NG/ COM2: OK/NG COM3: OK/NG/ COM4: OK/NG COM5: OK/NG/ COM6: OK/NG PC: OK/NG	
			NMEA PORT TEST	COM4:OK/NG COM5: OK/NG COM6: OK/NG	
			AD-10 PORT TEST	AD10 : OK/NG	
			BLUE SIGN TEST	BLUE SIGN: OFF/ON	*Added:* *FA-1501 Ver. 02.02 and after* *FA-1502 Ver02.01 and aft*
		ALARM HISTORY	"ALARM LIST"	e.g: MKD 22/JUN 01:49:10	
		I/O MONITOR	COM1/ COM 2 COM 3 COM 4/COM 5/COM6/PC/GPS	e.g: $PFEC,AI----------	

FOR SERVICE	Password: *Up key -> Down key ->Left key -> Right key -> NAV -> DIM -> DISP -> ENT -> MENU -> NAV*	OTHER	SIM MODE	OFF/TOKYO/OSAKA/ROTTERDAM	
			ALARM MODE	CONTINUOUS/KEY STOP	
			CH MODE	INT/USA	
			ALL CLEAR	ARE YOU SURE? YES NO	
			DEBUG MENU *Cont'd*	[CPU VERSION] 2450018-02.0x MAIN: X1.69.B1 200910201642 SUB : 01.01 200504151523 FPGA : 02.02 20090A07	
				[A/D MONITOR] VF : xxx / VR : xx / REF : xxx	
				[SS/SN MONITOR] RX1_SS : xx / RX2_SS : xx DSC_SS : xx RX1_SN : xx / RX2_SN : xx DSC_SN : xx	
				LOW POWER 1W/2W	
			SILENT MENU *NOTE*	***ON/OFF***	
			CHECK SUM *NOTE*	***CHECK/UNCHECK***	

NOTE:

- Call up the SILENT MENU and CHECK SUM
  1. Turn ON Power while press [MENU] and [ENT] key, then input the Password.
  2. Call up; FOR SERVICE -> OTHER -> SILENT MENU: ON

- How to call up the "SELECT MODE":
  Press [DIM] key, until "SELECT MODE" appear

AP6.6 Abbreviations

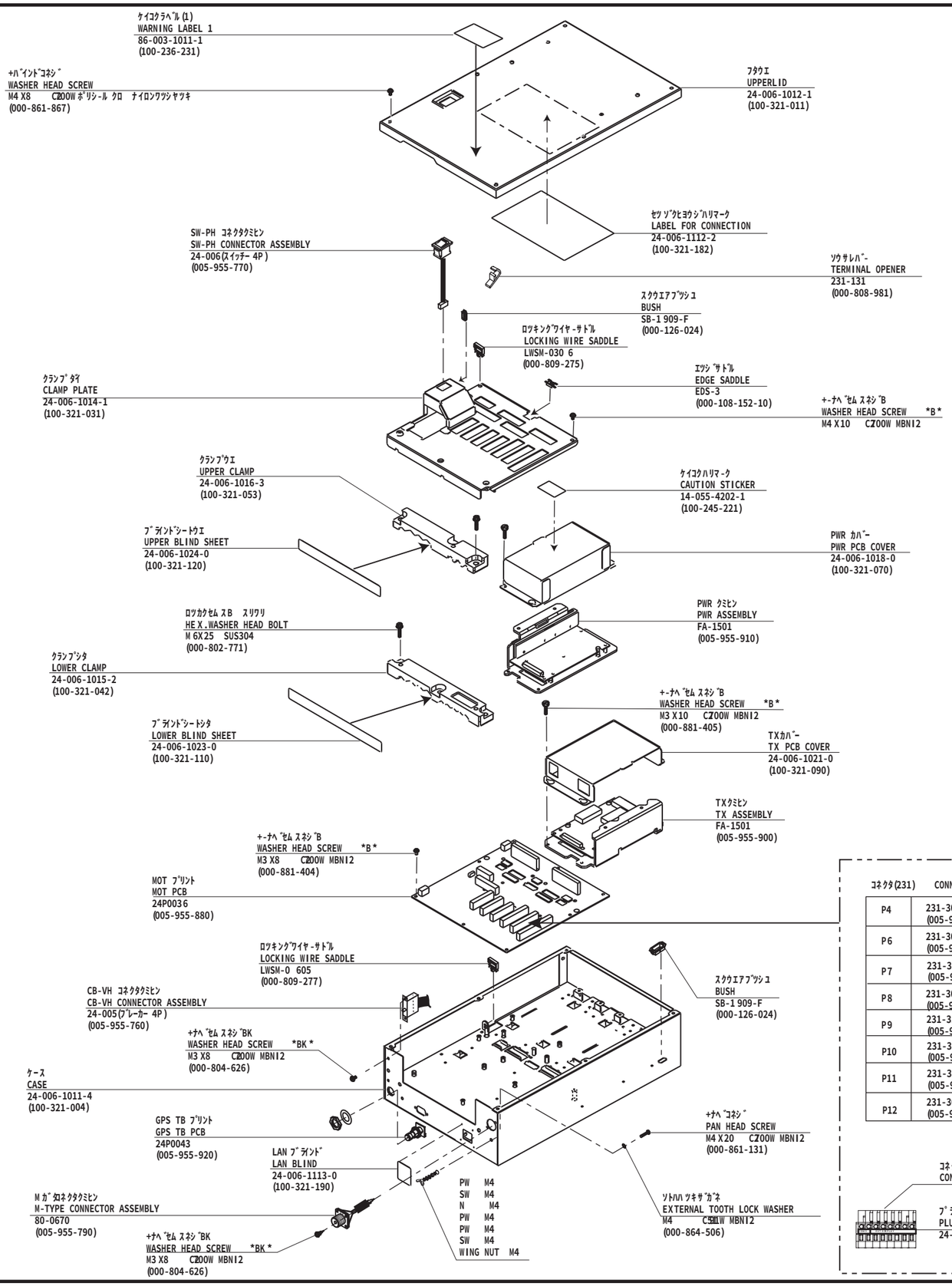
Abbreviations	Means
AI	Application Identifier
AIS	Automatic Identification System
AI-IP	Automatic Identification via Internet Protocol
ADN/ADNR	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ASCII	American Standard Code for Information Interchange
ATIS	Automatic Transmitter Identification System A-to-N Aids to Navigation
CCNR	Central Commission for Navigation on the Rhine
COG	Course Over Ground
COMPRIS	Consortium Operational Management Platform River Information Services
CSTDMA	Carrier Sense Time Division Multiple Access
DAC	Designated Area Code
DC	Danube Commission
DGNSS	Differential GNSS
DSC	Digital Selective Calling
ECDIS	Electronic Chart Display and Information System
EMMA	European Multiservice Meteorological Awareness system
ENI	Unique European Vessel Identification Number
ERI	Electronic Reporting International
ETA	Estimated Time of Arrival
FI	Functional Identifier
GLONASS	Global Navigation Satellite System(Russian)
GlW	Gleichwertiger Wasserstand (reference water level in Germany)
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communication
GUI	Graphical User Interface
HDG	Heading
IAI	International Application Identifier
IANA	Internet Assigned Numbers Authority
IALA	International Association of Lighthouse Authorities
ID	Identifier
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IMO	International Maritime Organization
IP	Internet Protocol
ITU	International Telecommunication Union
MKD	Minimum Keyboard and Display
MID	Maritime Identification Digits
MHz	Megahertz (Megacycles per second)
MMSI	Maritime Mobile Service Identifier
OLR	Overeen gekomen lage Rivierstand (reference water level in the Netherlands)
RAI	Regional Application Identifier
RAIM	Receiver Autonomous Integrity Monitoring
RIS	River Information Services
RNW	Regulierungs Niederwasser (granted water level during 94% the year)
ROT	Rate Of Turn

RTA	Requested Time of Arrival
SAR	Search And Rescue
SOG	Speed Over Ground
SOLAS	Safety Of Life At Sea
SOTDMA	Self Organizing Time Division Multiple Access
SQRT	Square Root
STI	Strategic Traffic Image
TDMA	Time Division Multiple Access
TTI	Tactical Traffic Image
UDP	User Datagram Protocol
UMTS	Universal Mobile Telecommunications System
UN	United Nations
UN/LOCODE	United nations Location Code
UTC	Universal Time Coordinated
VDL	VHF Data Link
VHF	Very High Frequency
VTS	Vessel Traffic Services
WGS-84	World Geodetic System from 1984
WiFi	Wireless Fidelity (IEEE 802.11 wireless networking standard)

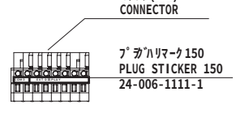
AP6.7 ERI (Electronic Reporting International) Code

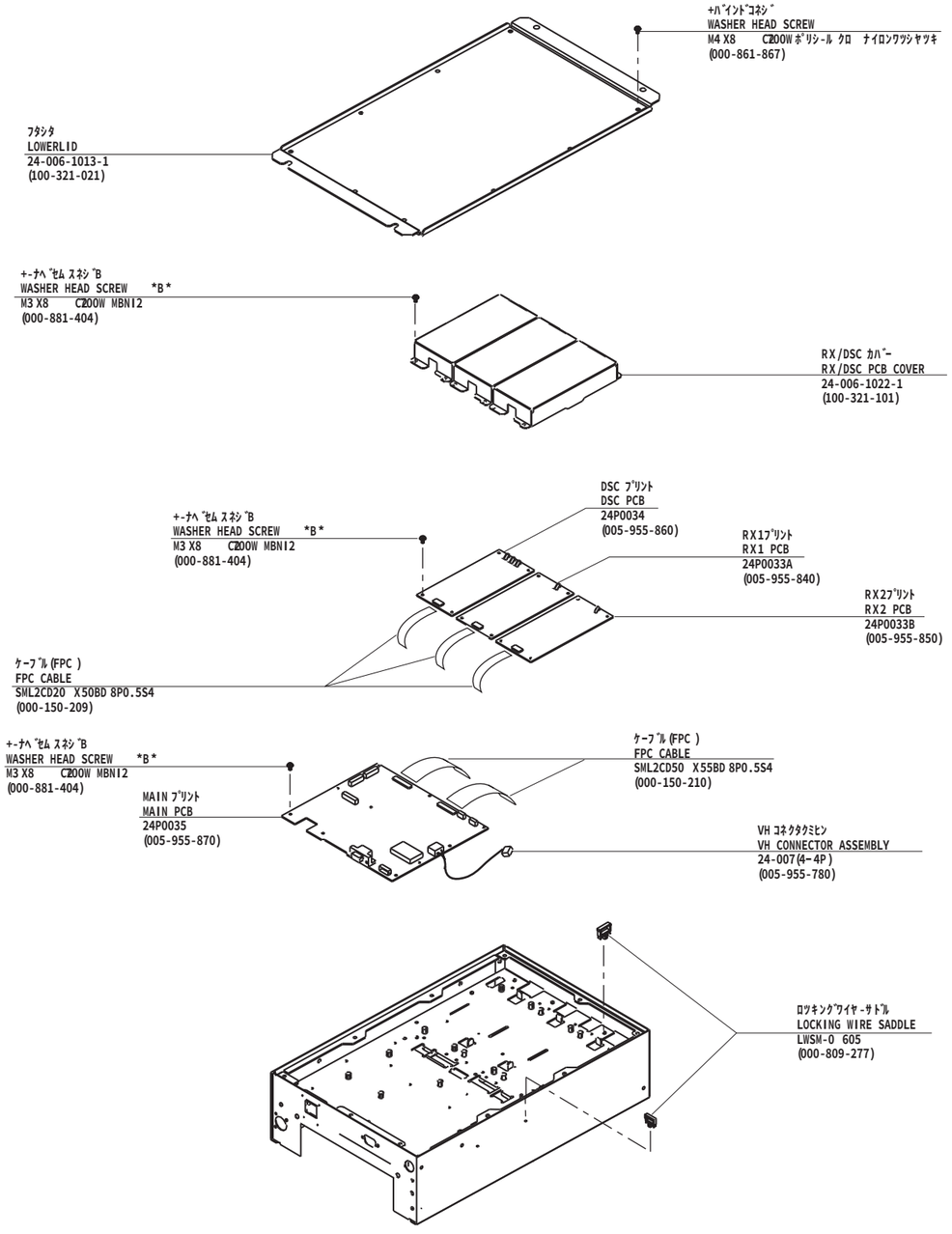
No.	Ship name
8000	Vessel, type unknown
8010	Motor freighter
8020	Motor tanker
8021	Motor tanker, liquid cargo, type N
8022	Motor tanker, liquid cargo, type C
8023	Motor tanker, dry cargo as if liquid (e.g. cement)
8030	Container vessel
8040	Gas tanker
8050	Motor freighter, tug
8060	Motor tanker, tug
8070	Motor freighter with one or more ships alongside
8080	Motor freighter with tanker
8090	Motor freighter pushing one or more freighters
8100	Motor freighter pushing at least one tank-ship
8110	Tug, freighter
8120	Tug, tanker
8130	Tug, freighter , coupled
8140	Tug, freighter/tanker, coupled
8150	Freight-barge
8160	Tank-barge
8161	Tank-barge, liquid cargo, type N
8162	Tank-barge, liquid cargo, type C
8163	Tank-barge, dry cargo as if liquid (e.g. cement)
8170	Freight-barge with containers
8180	Tank-barge, gas
8210	Push-tow, one cargo barge
8220	Push-tow, two cargo barges
8230	Push-tow, three cargo barges
8240	Push-tow, four cargo barges
8250	Push-tow, five cargo barges
8260	Push-tow, six cargo barges
8270	Push-tow, seven cargo barges
8280	Push-tow, eight cargo barges
8290	Push-tow, nine or more barges
8310	Push-tow, one tank/gas barge
8320	Push-tow, two barges at least one tanker or gas barge
8330	Push-tow, three barges at least one tanker or gas barge
8340	Push-tow, four barges at least one tanker or gas barge
8350	Push-tow, five barges at least one tanker or gas barge
8360	Push-tow, six barges at least one tanker or gas barge
8370	Push-tow, seven barges at least one tanker or gas barge
8380	Push-tow, eight barges at least one tanker or gas barge
8390	Push-tow, nine or more barges at least one tanker or gas barge
8400	Tug, single
8410	Tug, one or more tows
8420	Tug, assisting a vessel or linked combination
8430	Push boat, single
8440	Passenger ship, ferry, cruise ship, red cross ship

8441	Ferry
8442	Red cross ship
8443	Cruise ship
8444	Passenger ship without accommodation
8450	Service vessel, police patrol, port service
8460	Vessel, work maintenance craft, floating derrick, cable-ship, buoy-ship, dredge
8470	Object, towed, not otherwise specified
8480	Fishing boat
8490	Bunker ship
8500	Barge, tanker, chemical
8510	Object, not otherwise specified
1500	General cargo Vessel maritime
1510	Unit carrier maritime
1520	bulk carrier maritime
1530	tanker
1540	liquefied gas tanker
1850	pleasure craft, longer than 20 meters
1900	fast ship
1910	hydrofoil



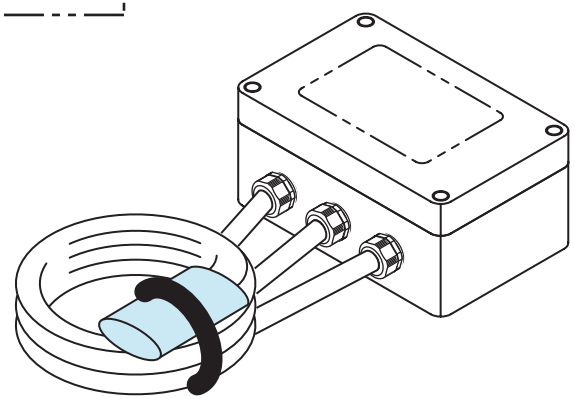
コネクタ(231)	CONNECTOR
P4	231-308/206-FUR (005-956-050)
P6	231-308/206-FUR (005-956-060)
P7	231-308/206-FUR (005-956-070)
P8	231-308/206-FUR (005-956-080)
P9	231-310/206-FUR (005-956-090)
P10	231-310/206-FUR (005-956-100)
P11	231-313/206-FUR (005-956-110)
P12	231-305/206-FUR (005-956-030)





MODEL	FA-150			
APPROVED	CHECKED	DRAWN	UNIT	FA-1501 トランスポンダ部 TRANSPONDER UNIT
10 Aug.2005	10 Aug.2005	10 Aug.2005		
H.Kuwamura	T.Yoshida	S.kubota	DWG.NO.	C4431-E01-B

ブンパイキ
DISTRIBUTION BOX
DB-1
(000-054-087)



ヒョウジブ
FA-1502
DISPLAY UNIT
(000-150-215)

フクコウクウチュウセンブ
GVA -100-T
GPS/VHF COMBINED ANTENNA
(000-041-941)

MODEL	FA-150			
APPROVED	CHECKED	DRAWN	UNIT	FA-1502/GVA -100/DB-1 表示部他
01 Sep 2005	01 Sep 2005	01 Sep 2005		DISPLAY UNIT AND OTHER S
H.Kuwamura	T.Yoshida	S kubota	DWG.NO.	C4431-E02-B

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FA-150 System Diagram		—	C4431-B01	S-3
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		24P0032-2/3	C4431-K05	S-5
		24P0032-3/3	C4431-K06	S-6
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		24P0062-2/3	C4431-K19	S-21
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	PLE	PLE24HSZ	C5003-K03	S-25
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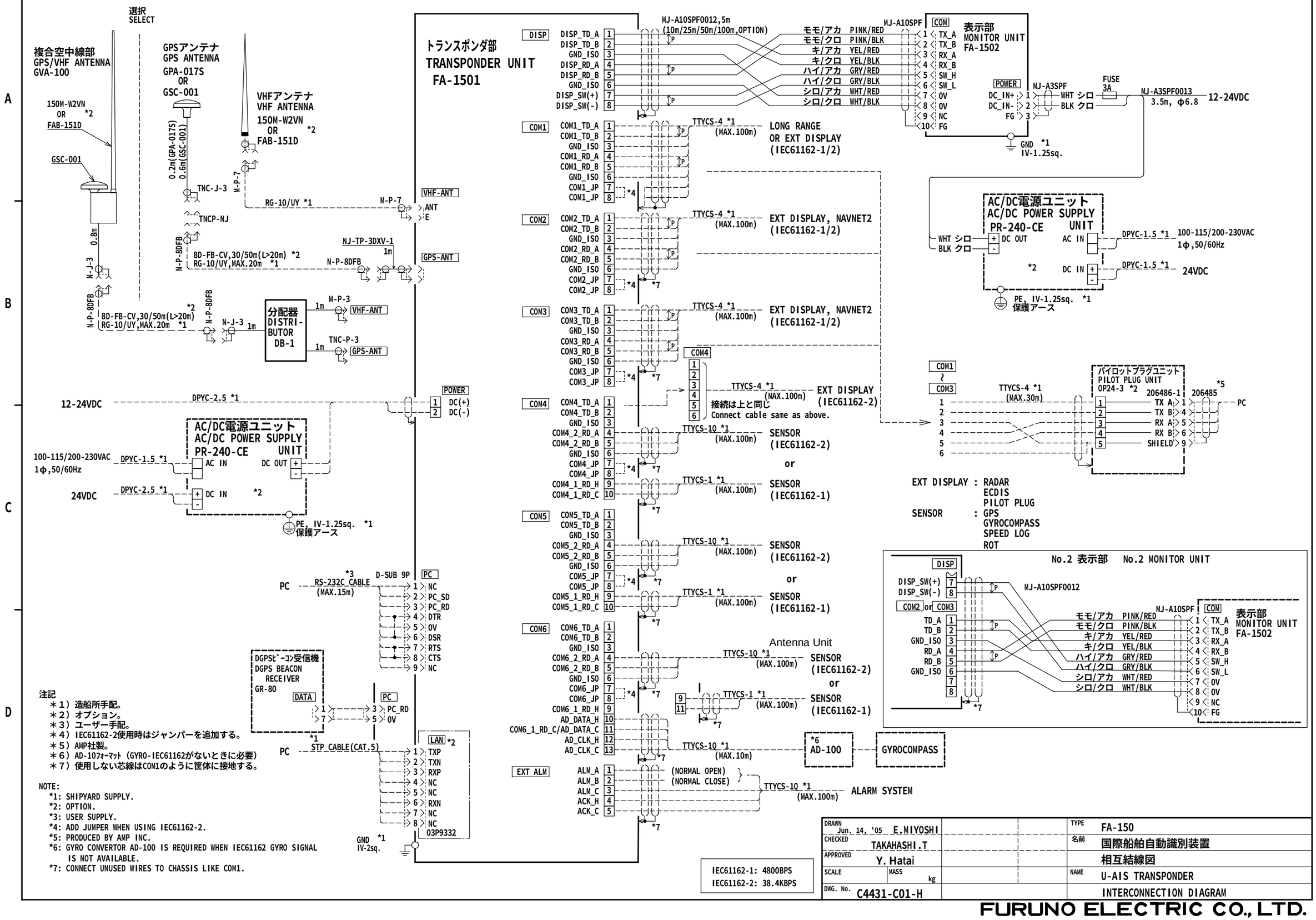
* FA-1502: Mother Board 24P0036 added (for INLAND AIS specification)

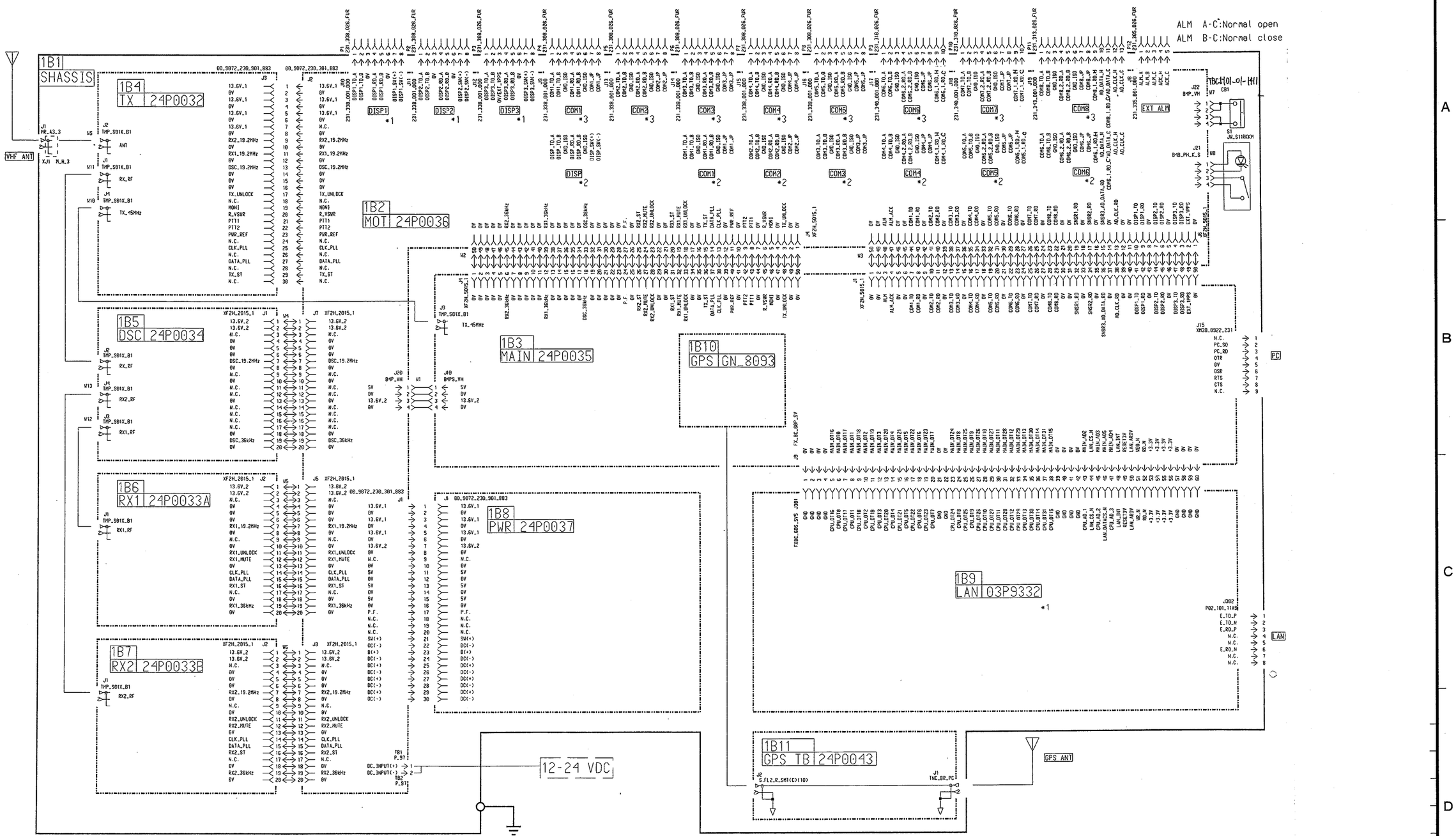
FURUNO

S − 1



DRAWN	Jun. 14, '05 E.MIYOSHI	TYPE	FA-150
CHECKED	TAKAHASHI.T	名前	国際船舶自動識別装置
APPROVED	Y. Hatai		相互結線図
SCALE	MASS kg	NAME	U-AIS TRANSPONDER
DWG. No.	C4431-C01-H		INTERCONNECTION DIAGRAM

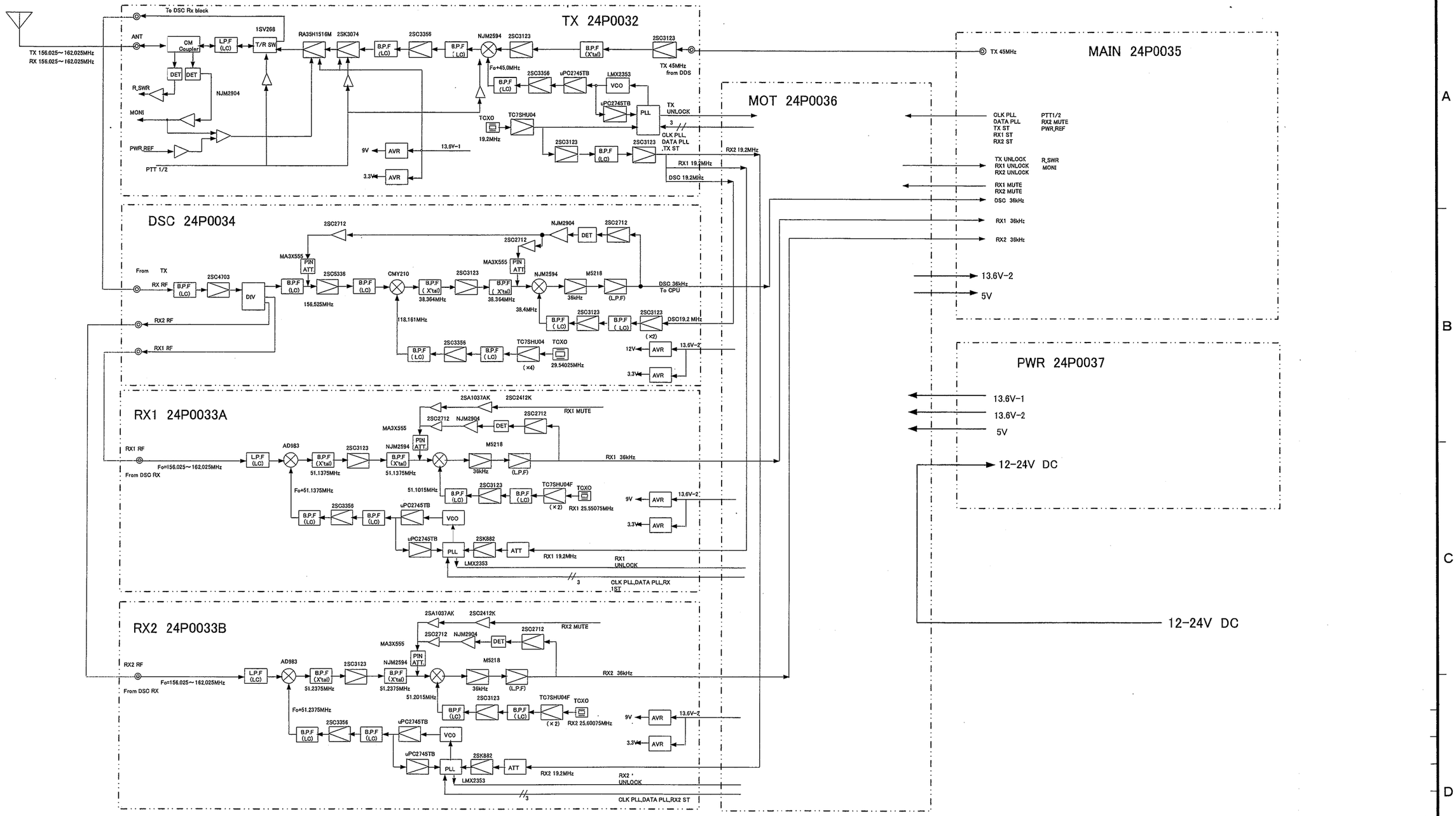
FURUNO ELECTRIC CO., LTD.



NOTE
*1: OPTION.
*2: FA-1501; CONNECTOR NAME
*3: FA-2001; CONNECTOR NAME

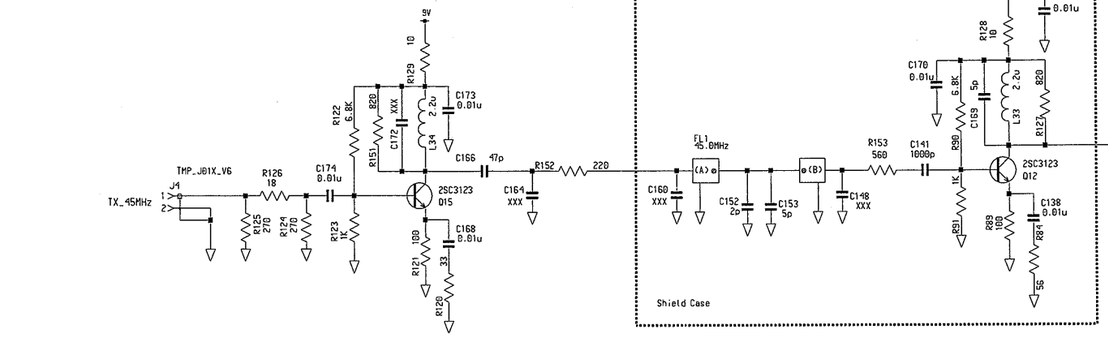
DRAWN 05/07/21 T.YAMASAKI			TYPE FA-150/200
CHECKED Jul.22'05 T.Takeuchi			名称 トランスポンダ部（総合）
APPROVED Jul.22.05 A.Hayashi		FA-150/200	回路図
SCALE	MASS	MODEL BLOCK No.	NAME TRANSPONDER UNIT (GENERAL)
Dwg No. C4431-K01- A		REF. No. 24-006-5011-2	SCHEMATIC DIAGRAM

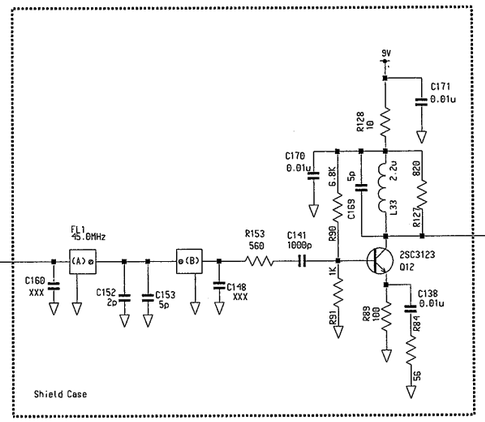
FURUNO ELECTRIC CO., LTD.

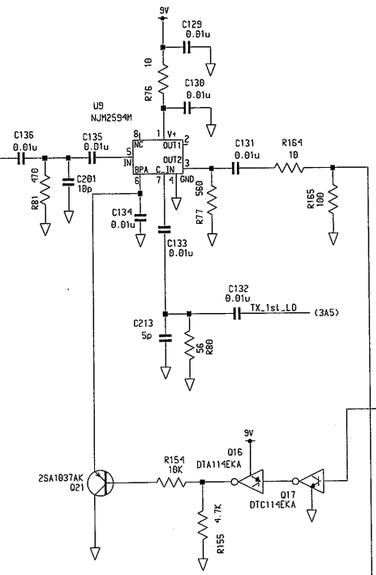


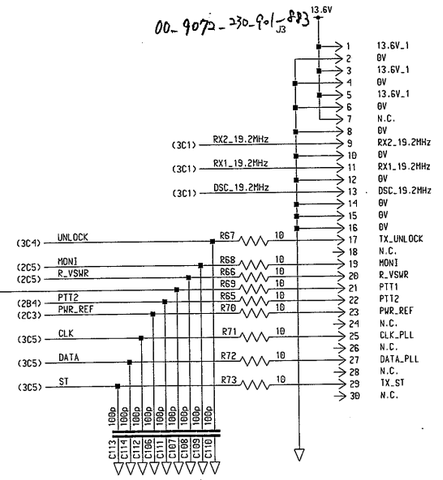
DRAWN 05/07/21 T. YAMASAKI		TYPE	FA-150
CHECKED Jul. 22 '05 T. Takeuchi		名称	国際船舶自動識別装置
APPROVED Jul. 22 '05 H. Hayashi	FA-150		ブロック図
SCALE / MASS	MODEL / BLOCK No.	NAME	U-AIS TRANSPONDER
Dwg No. C4431-B01- A	REF. No. 24-006-5032-0		BLOCK DIAGRAM

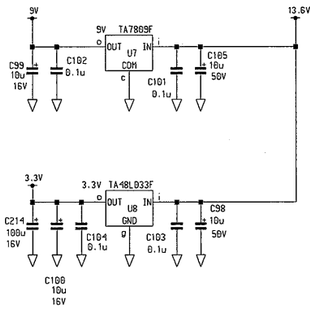
FURUNO ELECTRIC CO., LTD.

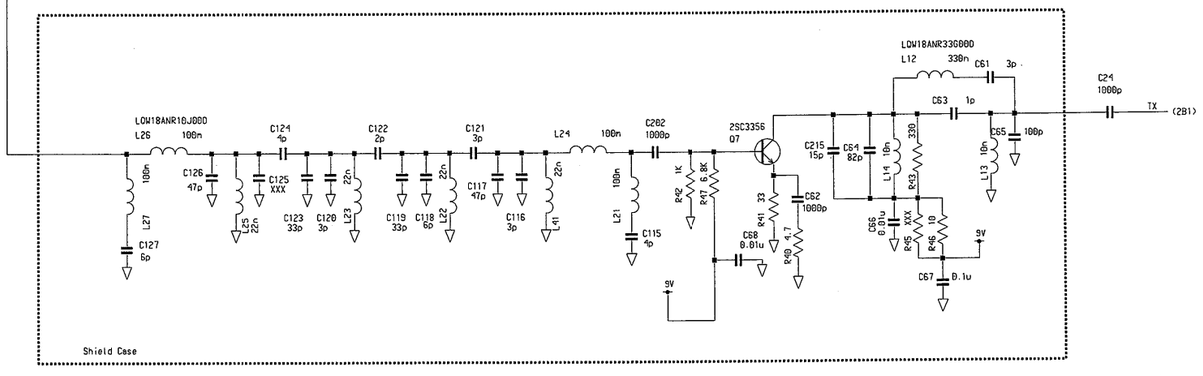




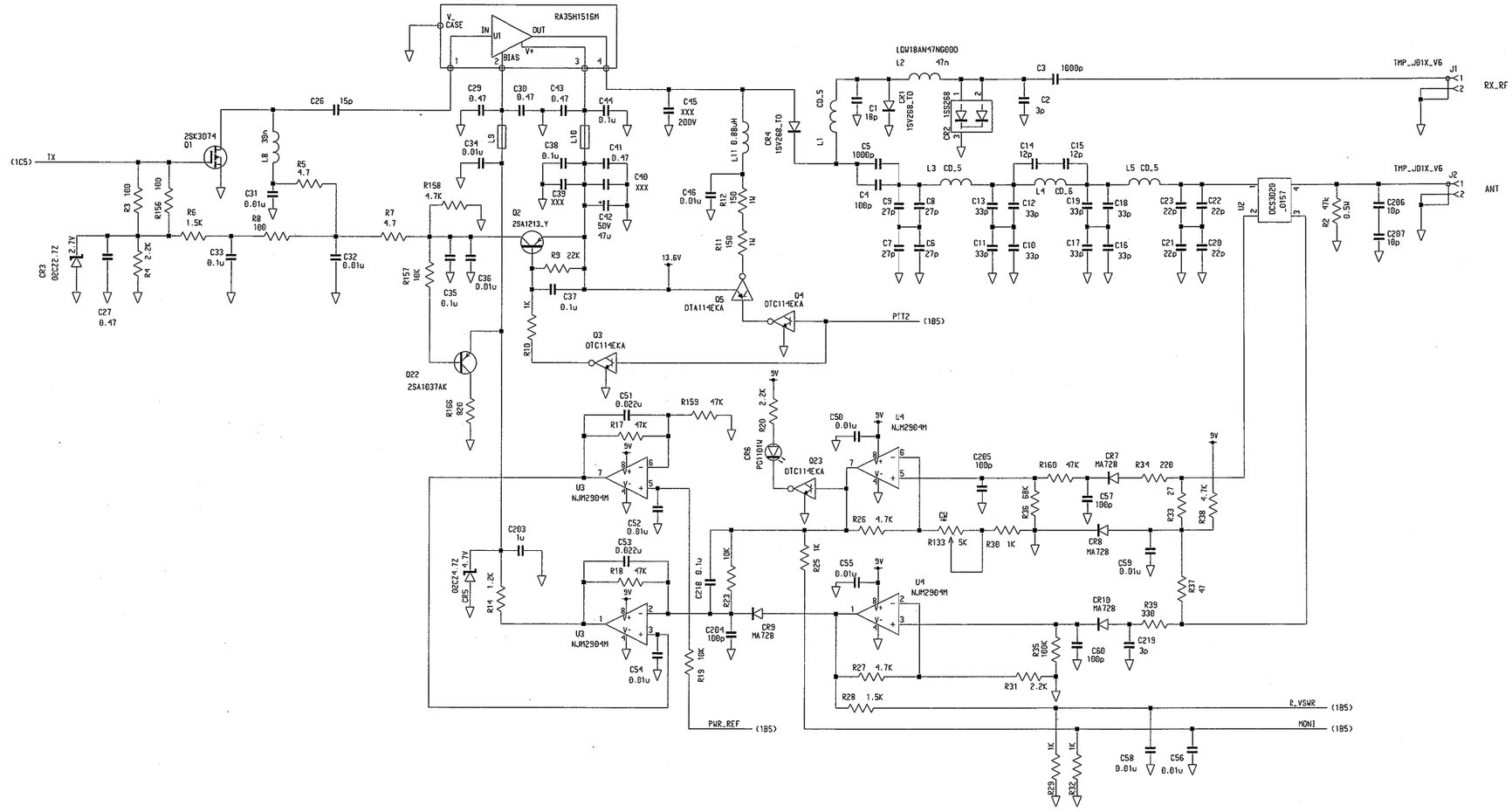






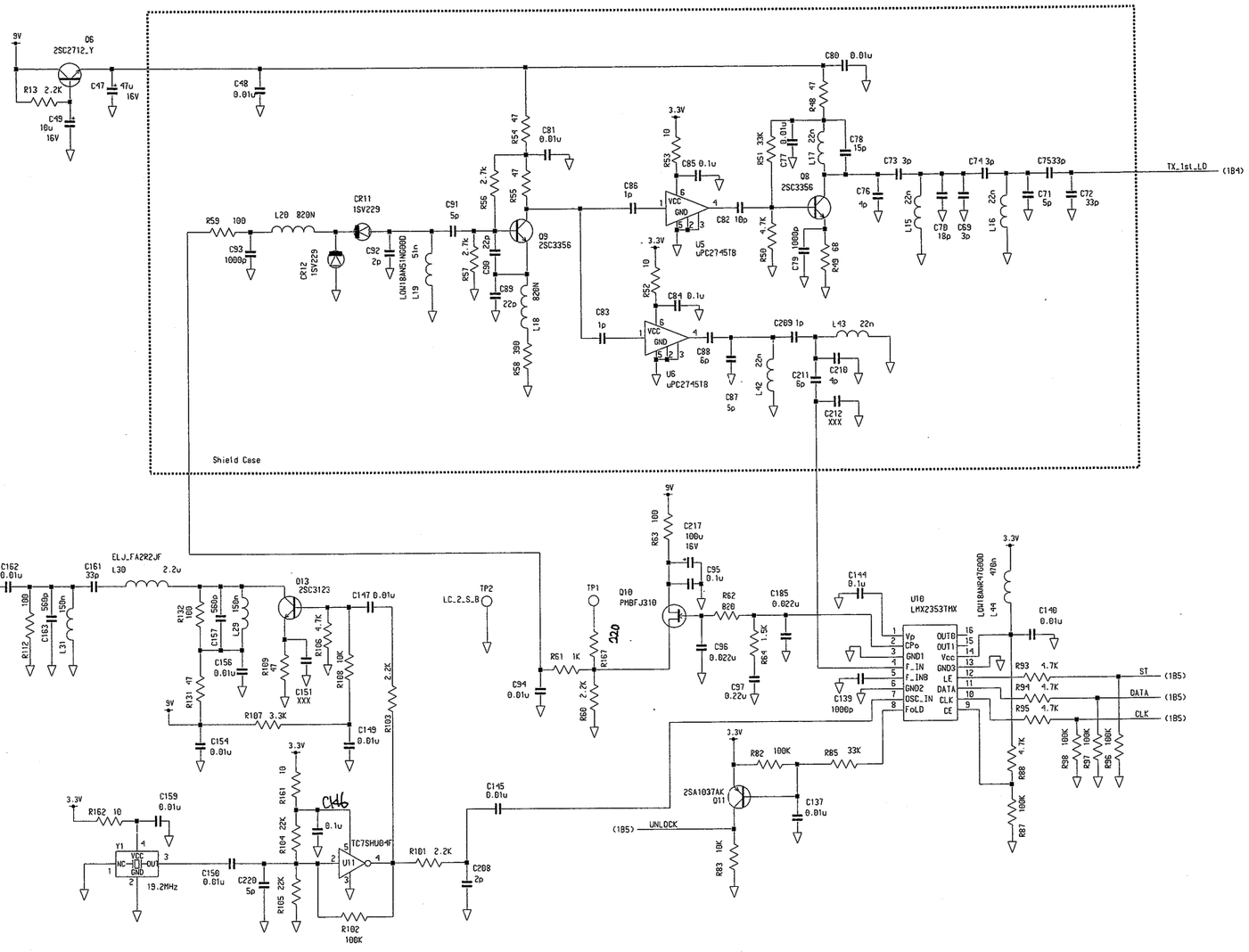


DRAWN 05/07/21 T. YAMASAKI			TYPE 24P0032 (1/3)
CHECKED Jul 22'05 T. Takano			名称 TX基板
APPROVED Jul 22'05 N. Hayashi		FA-150	回路図
SCALE	MASS	MODEL BLOCK No.	NAME TX PCB
Dwg No. C4431-K04- A		REF. No. 24-006-5012-1	SCHEMATIC DIAGRAM

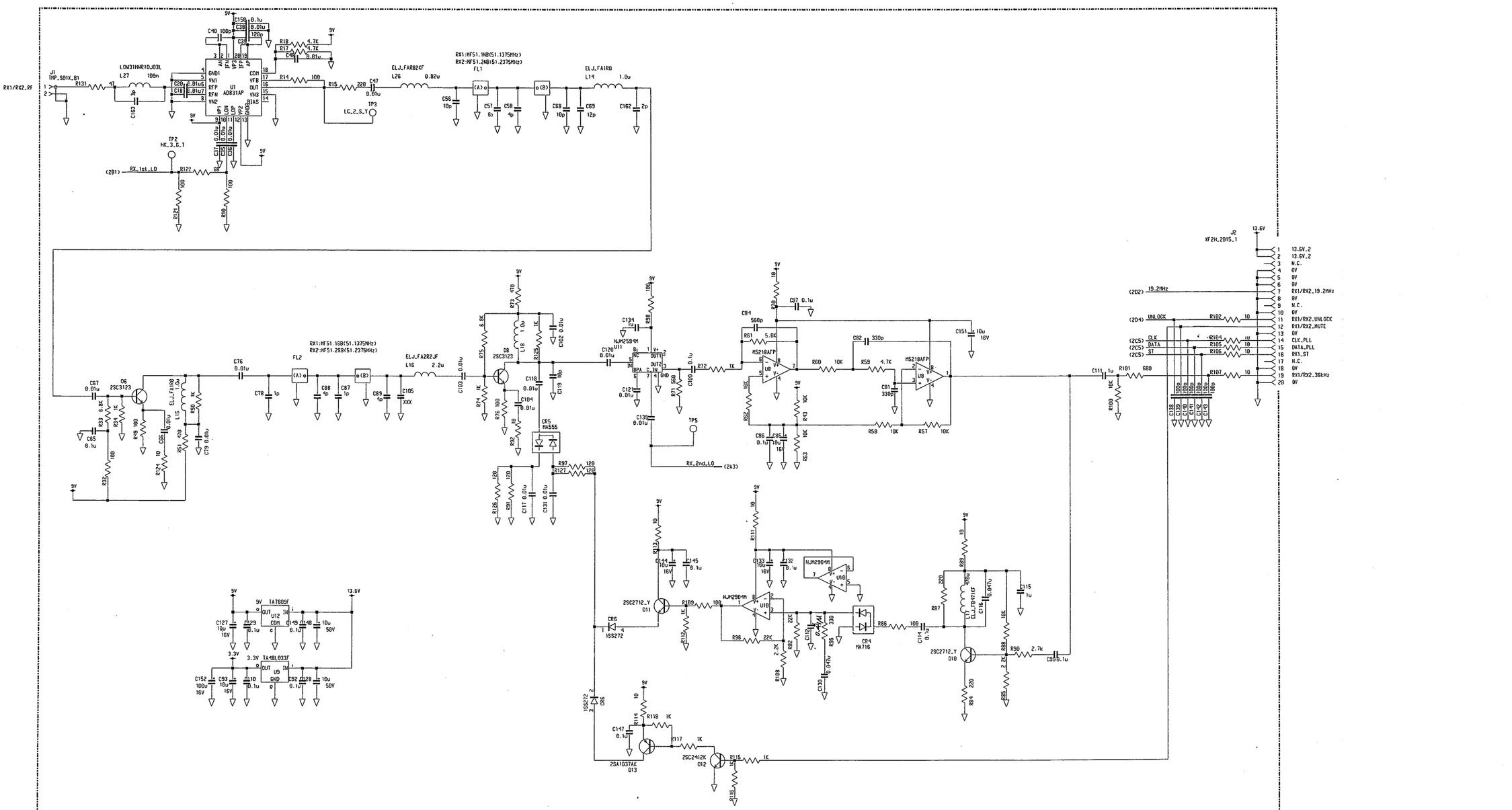


DRAWN 05/07/21 T. YAMASAKI		TYPE	24P0032 (2/3)
CHECKED Jul 22 '05 T. Takiura		名称	TX基板
APPROVED Jul. 22 '05 M. Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	TX PCB
Dwg No. C4431-K05- A	REF. No. 24-006-5013-0		SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.

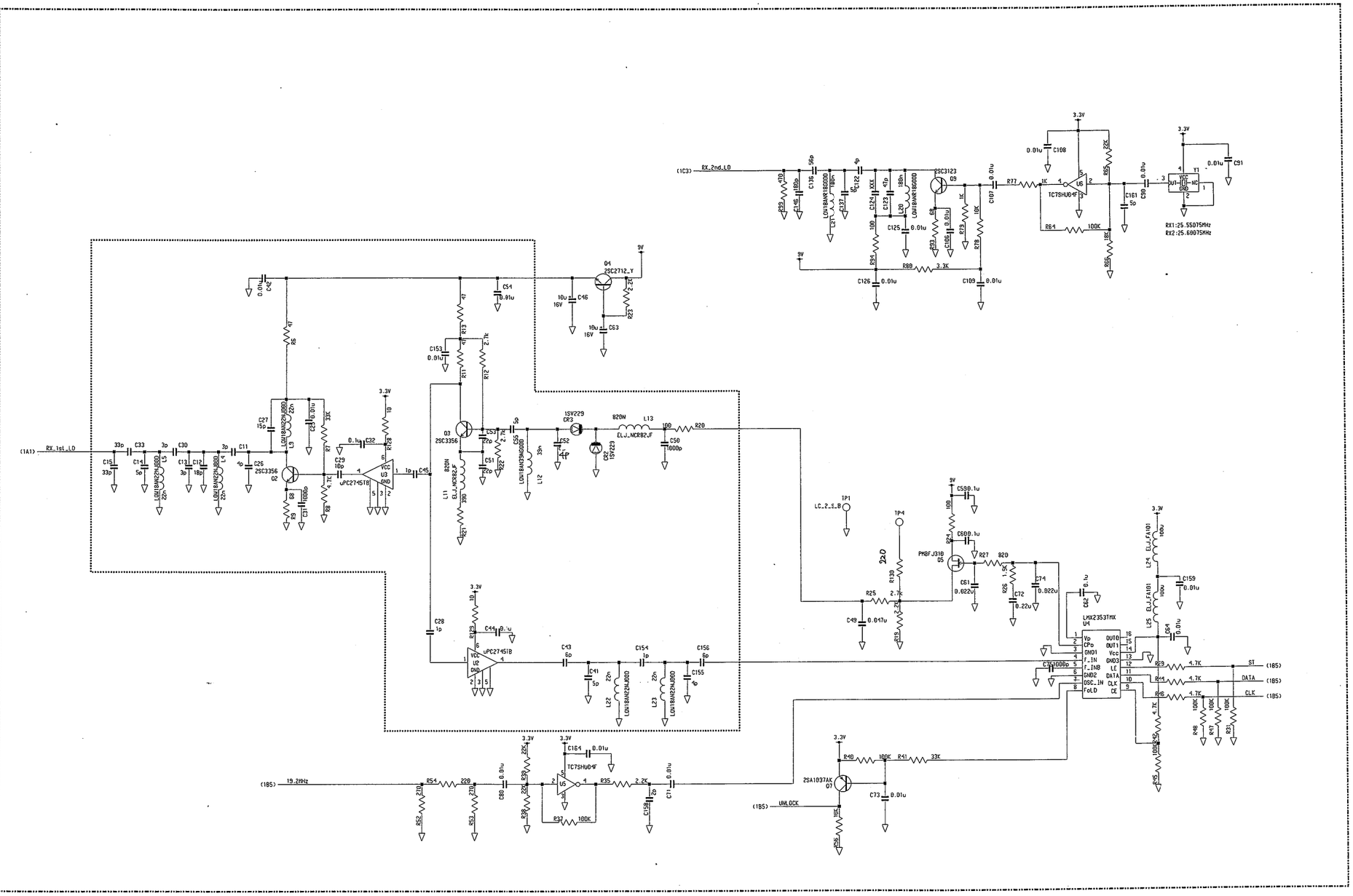


DRAWN 05/07/21 T. YAMASAKI		TYPE	24P0032 (3/3)
CHECKED Jul.22'05 T.Takeuchi		名称	TX基板
APPROVED Jul.22'05 M.Hayashi	FA-150		回路図
SCALE / MASS	.MODEL / BLOCK No.	NAME	TX PCB
Dwg No. C4431-K06- A	REF. No. 24-006-5014-1		SCHEMATIC DIAGRAM



DRAWN 05/07/21 T. YAMASAKI		TYPE	24P0033 (1/2)
CHECKED Jul. 22'05 T. Takeno		名称	RX1/RX2基板
APPROVED Jul. 22'05 M. Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	RX1/RX2 PCB
Dwg No. C4431-K07- A	REF. No. 24-006-5015-2		SCHEMATIC DIAGRAM

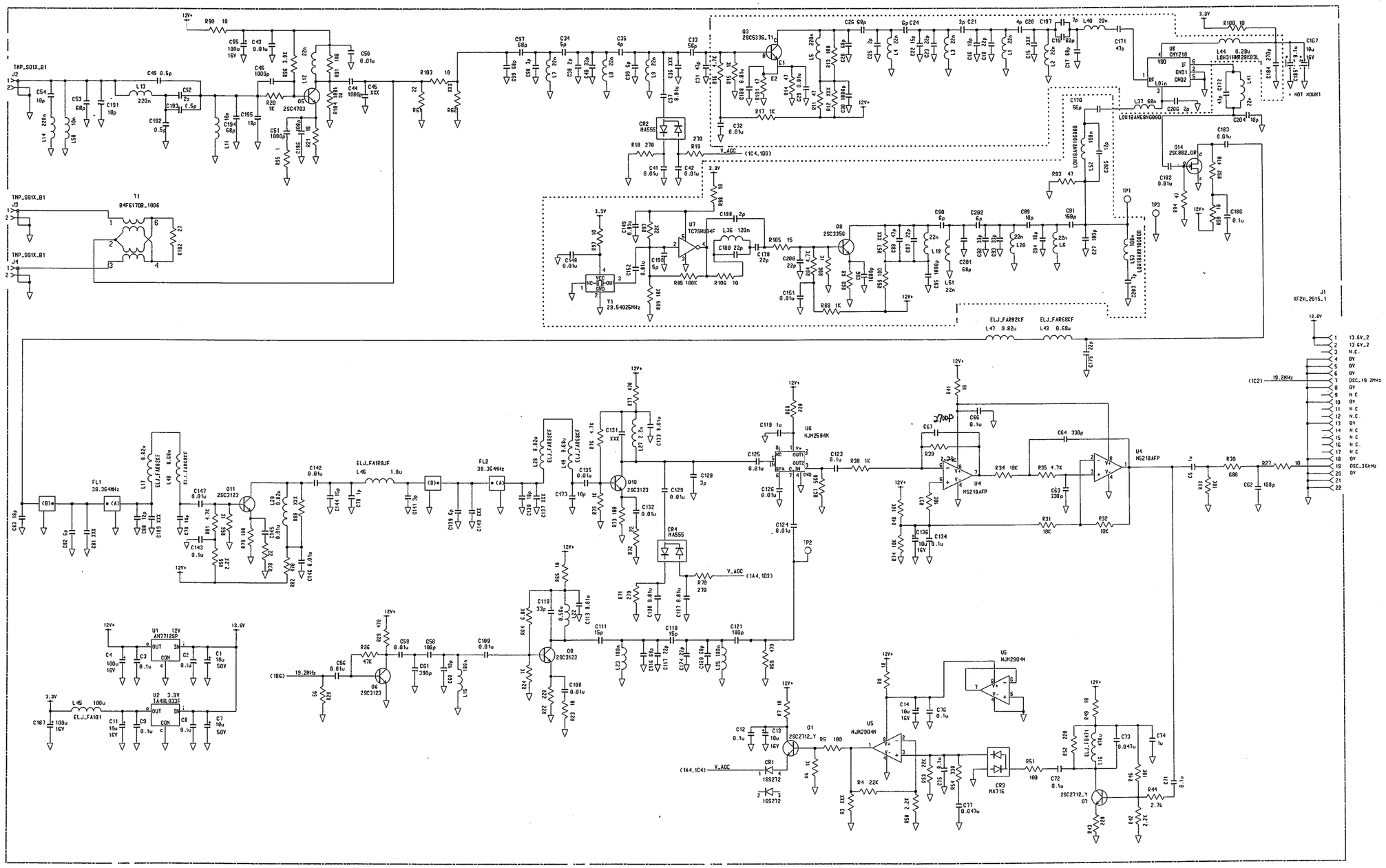
FURUNO ELECTRIC CO., LTD.



DRAWN 05/07/21 T. YAMASAKI		TYPE	24P0033 (2/2)
CHECKED Jul. 22'05 T. Takeuchi		名称	RX1/RX2基板
APPROVED Jul. 22'05 H. Nagashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	RX1/RX2 PCB
Dwg No. C4431-K08- A	REF. No. 24-006-5016-1		SCHEMATIC DIAGRAM

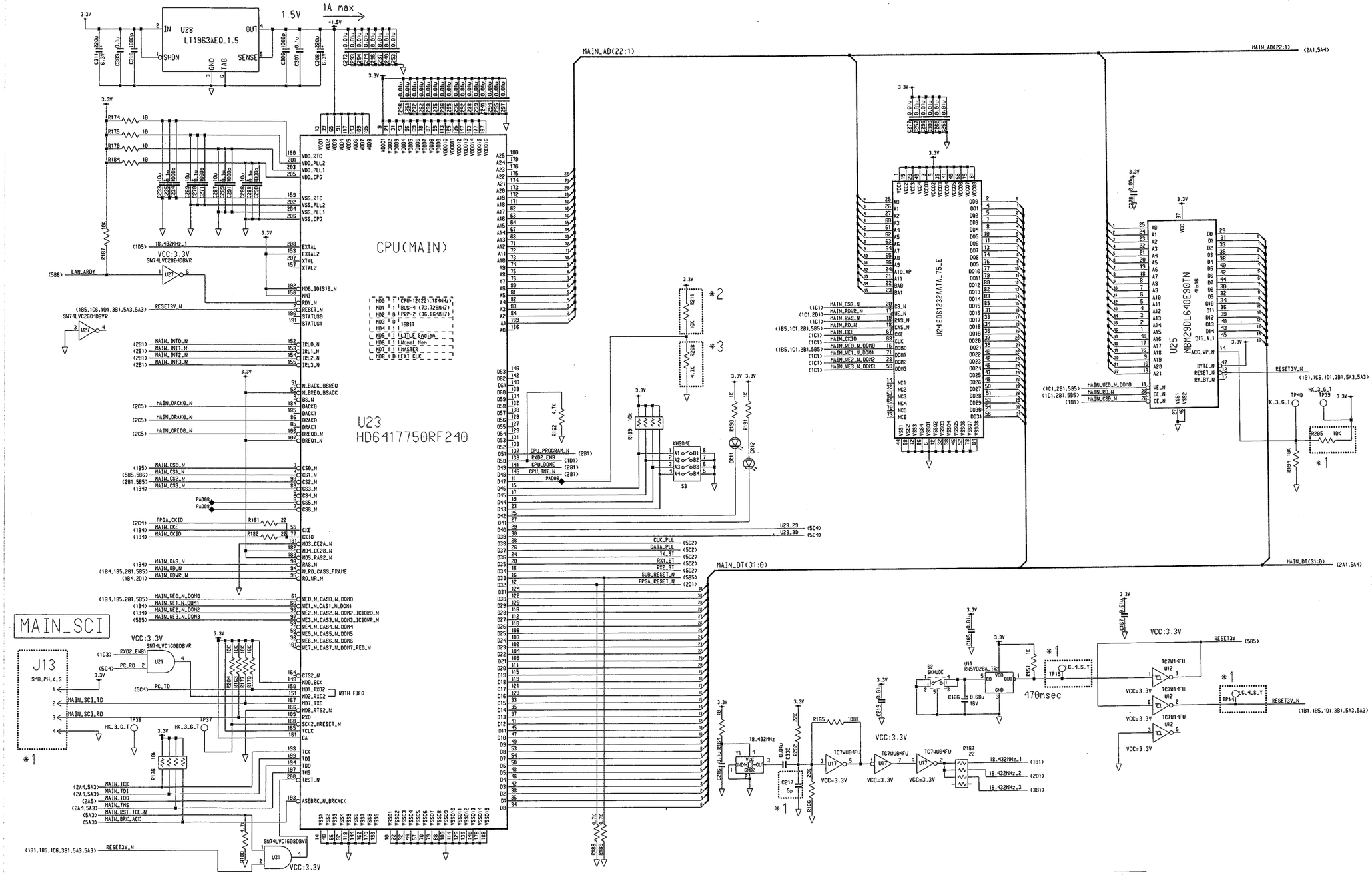
FURUNO ELECTRIC CO., LTD.

FURUNO



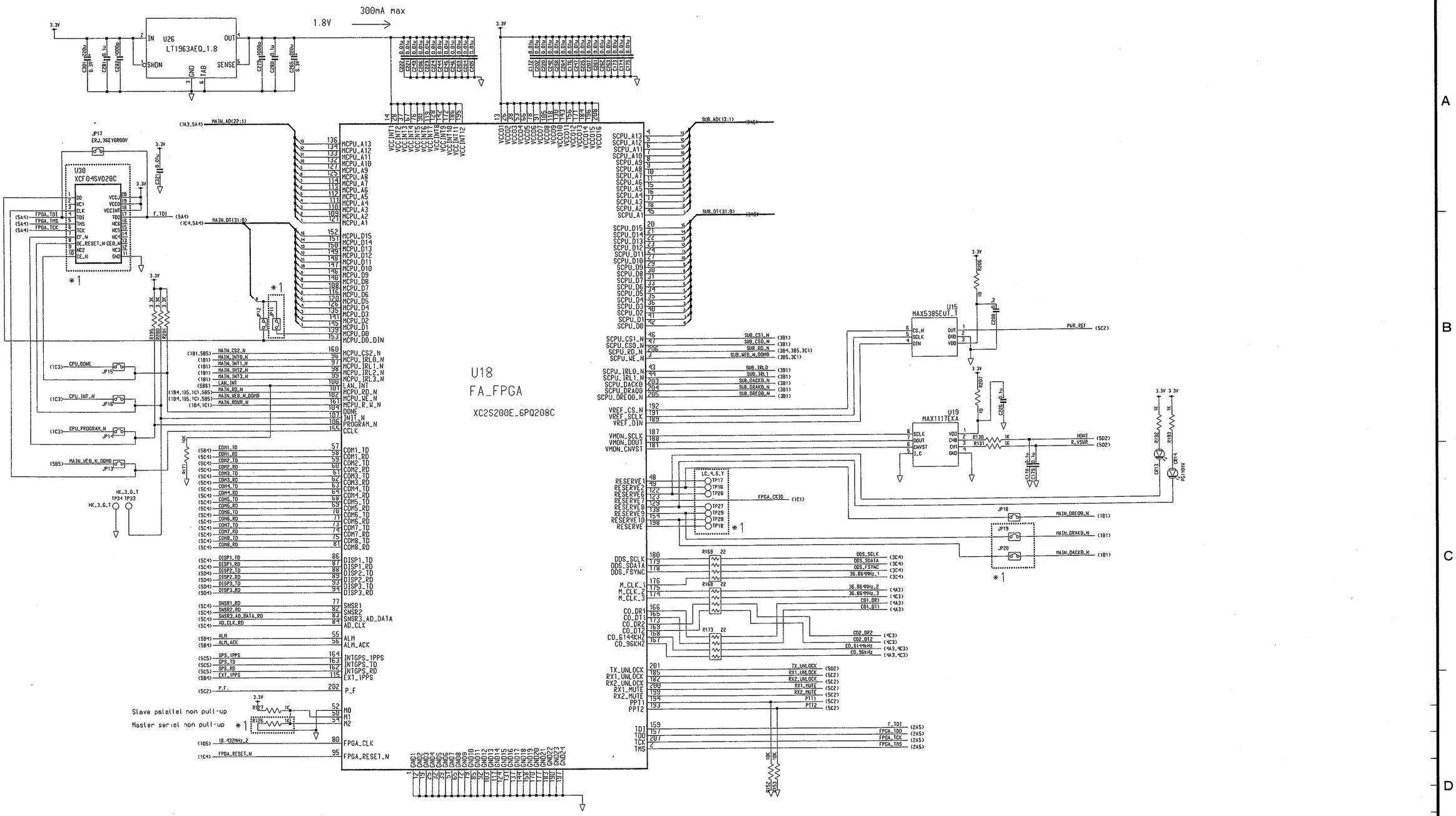
DRAWN 05/07/21 T. YAMASAKI		TYPE	24P0034
CHECKED Jul 22'05 T. Takeuchi		名称	DSC基板
APPROVED Jul 22 '05 H. Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	DSC PCB
Dwg No. C4431-K09- A	REF. No. 24-006-5017-2		SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.



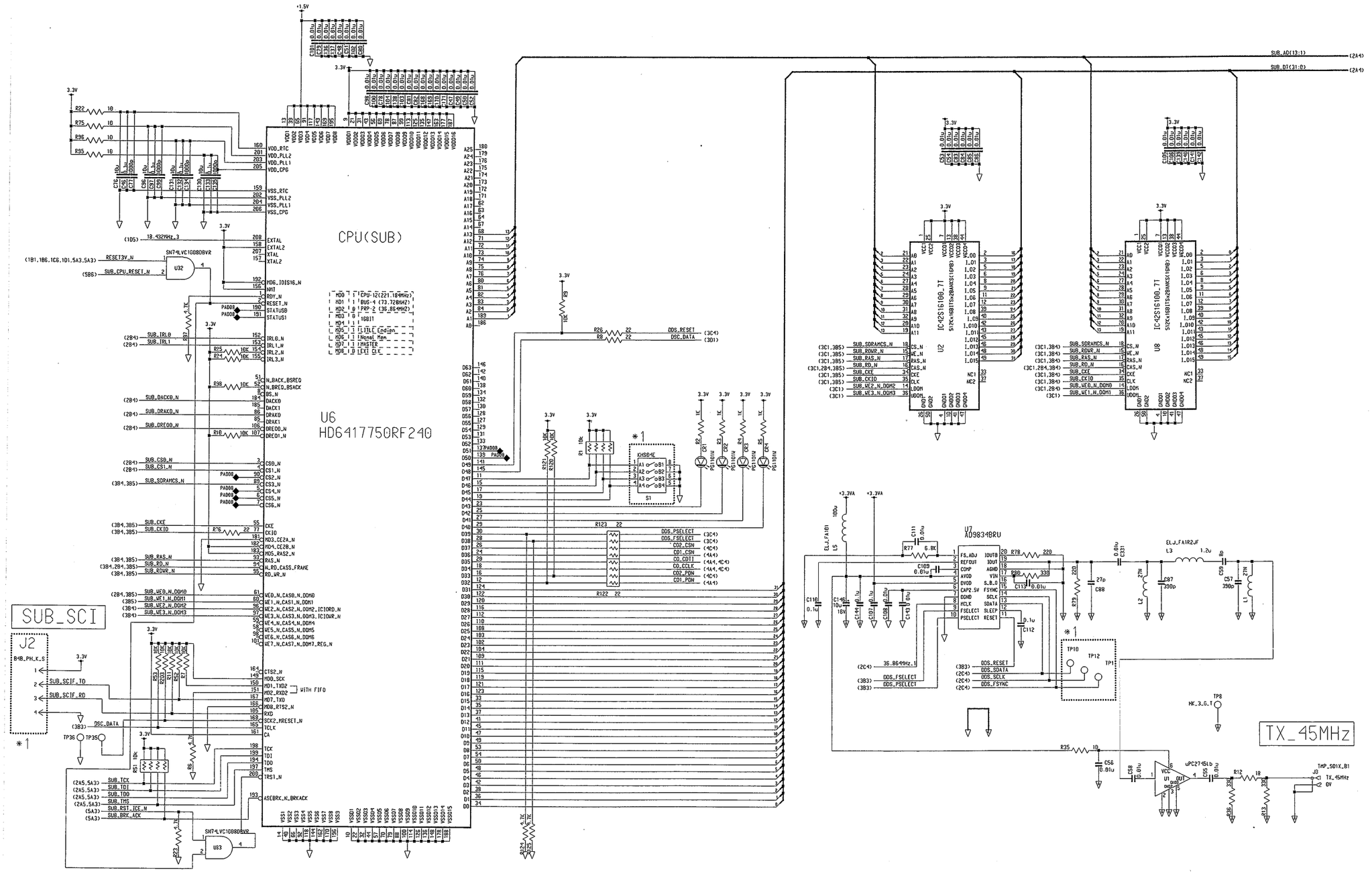
NOTE
*1: PATTERN ONLY.
*2: MOUNT FOR FA-1501 ONLY
*3: MOUNT FOR FA-2001 ONLY

DRAWN 05/07/21 T.YAMASAKI		TYPE	24P0035 (1/5)
CHECKED Jul 22'05 T.Takeuchi		名称	MAIN基板
APPROVED Jul 22'05 H.Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	MAIN PCB
Dwg No. C4431-K10- A	REF. No. 24-006-5018-0		SCHEMATIC DIAGRAM



DRAWN 05/07/21 T. YAMASAKI		TYPE	24P0035 (2/5)
CHECKED Mar.22'05 T.Takizawa		名称	MAIN基板
APPROVED Mar.22'05 H.Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	MAIN PCB
Dwg No. C4431-K11- A	REF. No. 24-006-5019-0		SCHEMATIC DIAGRAM

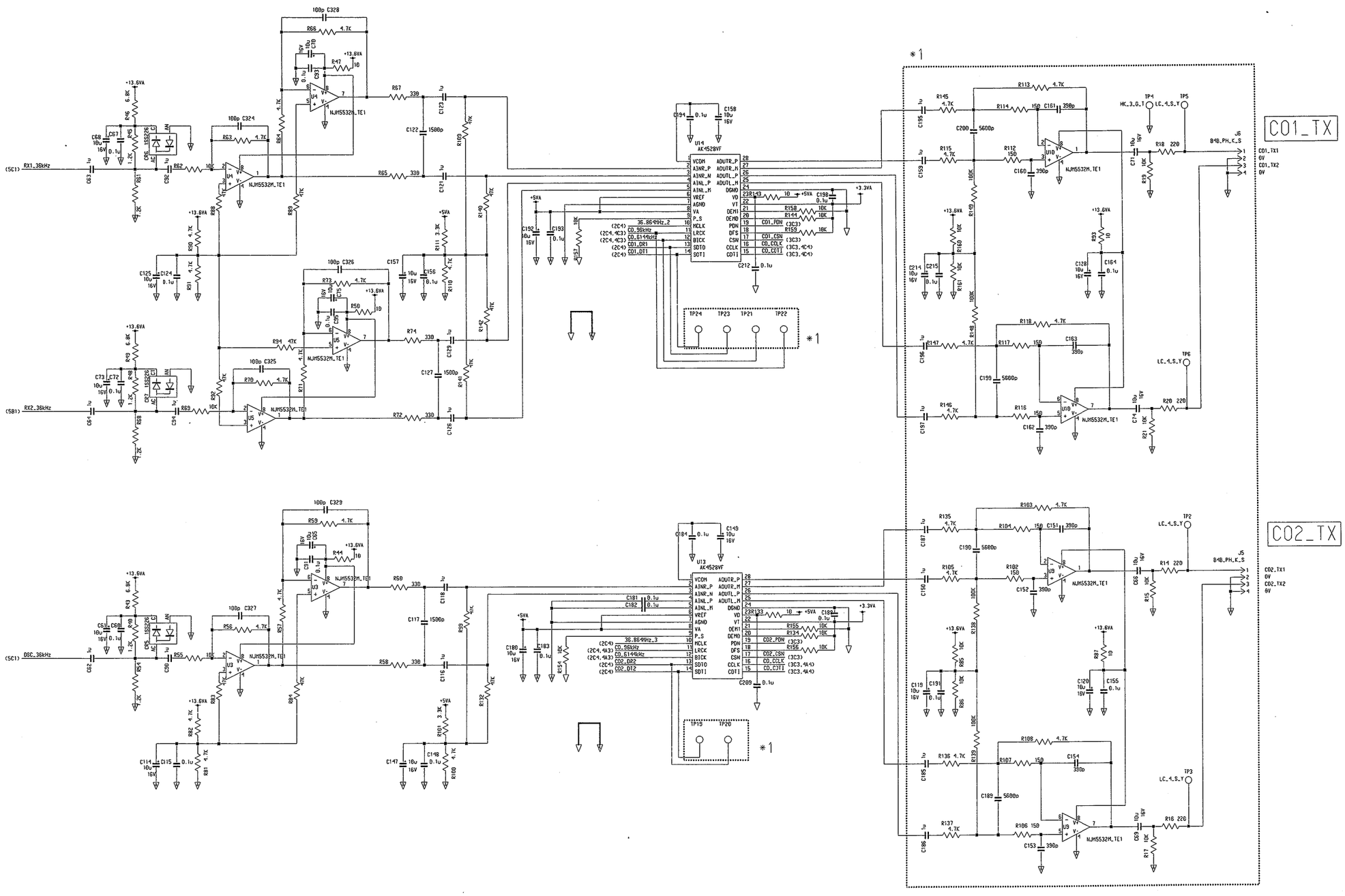
FURUNO ELECTRIC CO., LTD.



NOTE
*1: PATTERN ONLY.

DRAWN 05/07/21 T.YAMASAKI		TYPE	24P0035 (3/5)
CHECKED Jul.22'05 T.Takano		名称	MAIN基板
APPROVED Jul.22'05 K.Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	MAIN PCB
Dwg No. C4431-K12- A	REF. No. 24-006-5020-0		SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.

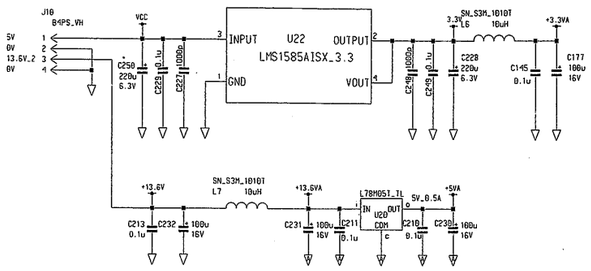


NOTE
*1: PATTERN ONLY.

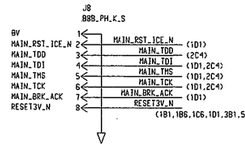
DRAWN 05/07/21 T. YAMASAKI		TYPE	24P0035 (4/5)
CHECKED Jul.22'05 T.Takewo		名称	MAIN基板
APPROVED Jul.22'05 A.Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	MAIN PCB
Dwg No. C4431-K13- A	REF. No. 24-006-5021-0		SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.

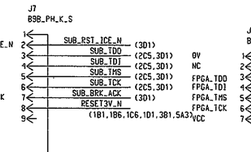
PWR



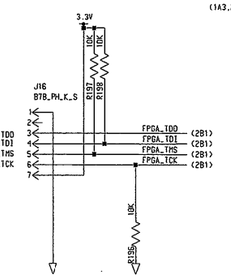
CPU(MAIN) JTAG



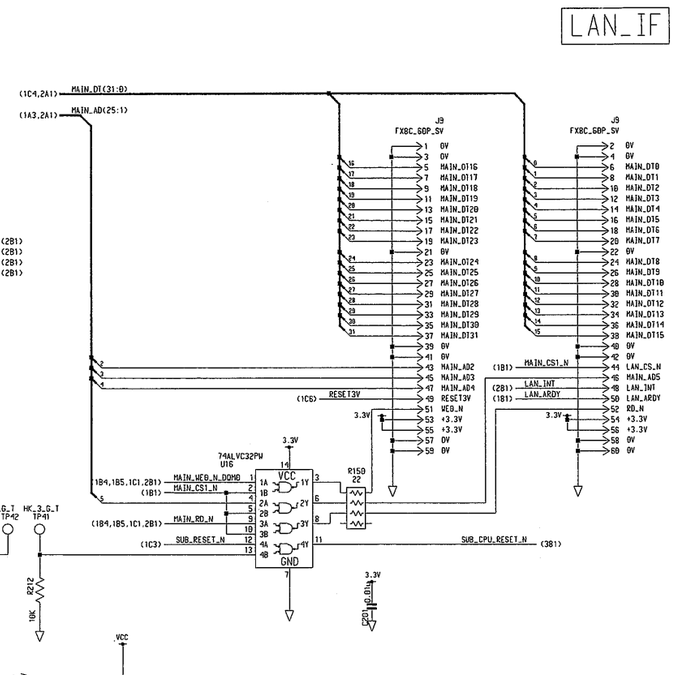
CPU(SUB) JTAG



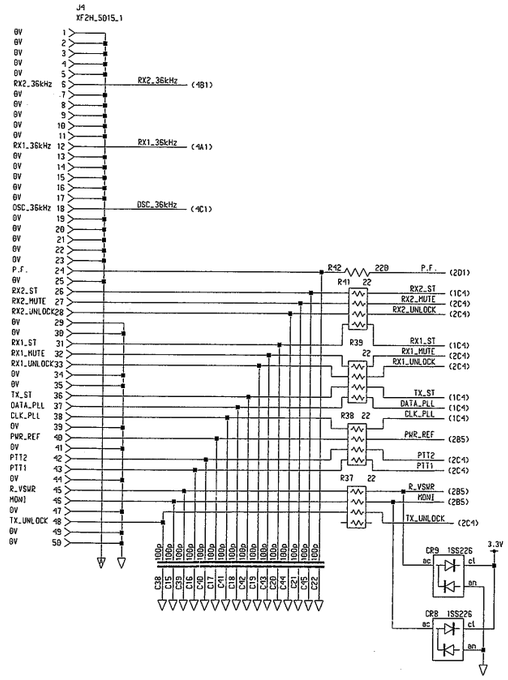
FPGA JTAG



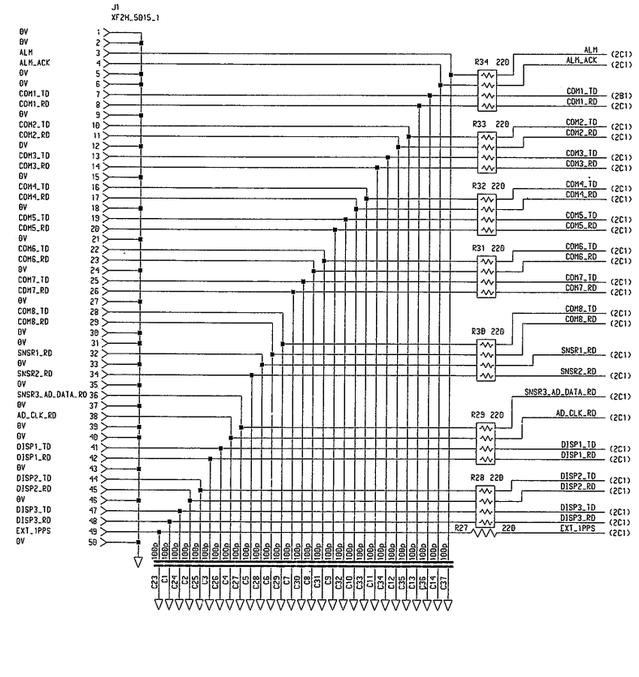
LAN_IF



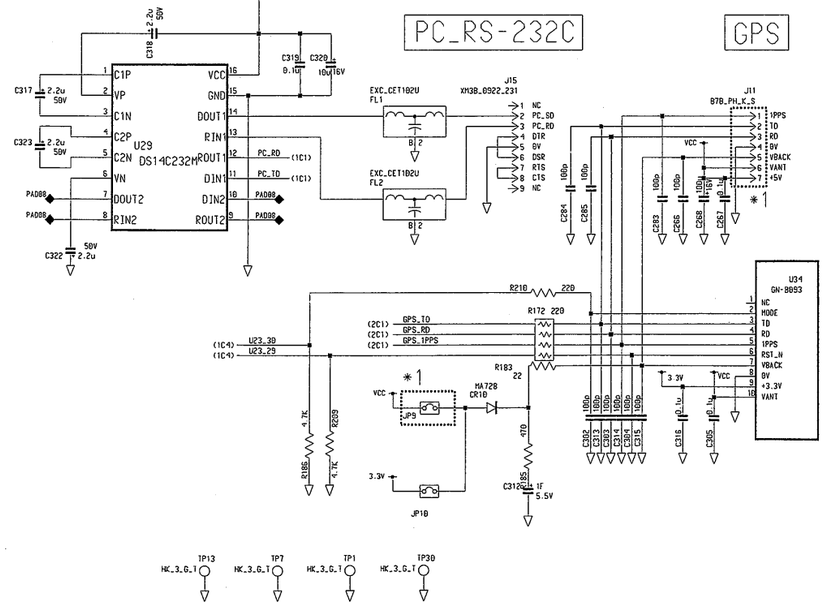
ANALOG



I/F



PC_RS-232C

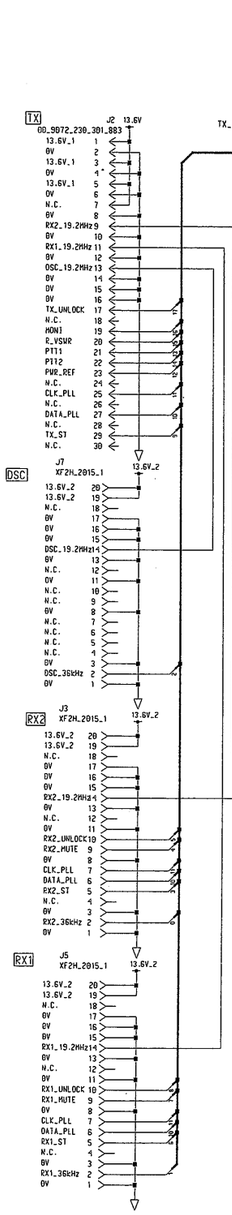


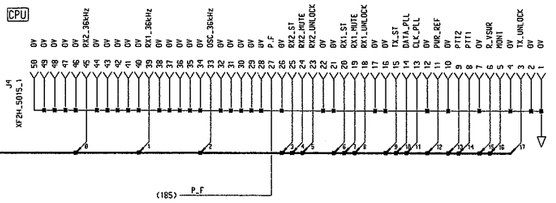
GPS

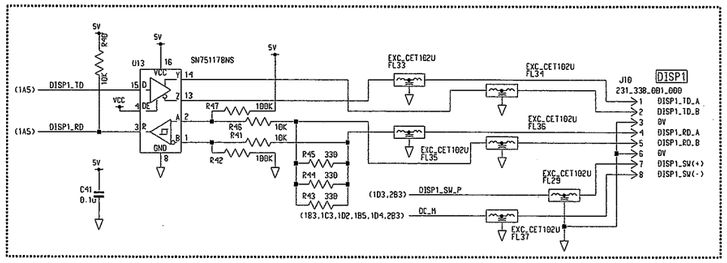
TP13 HK_3.6_T
TP7 HK_3.6_T
TP1 HK_3.6_T
TP30 HK_3.6_T

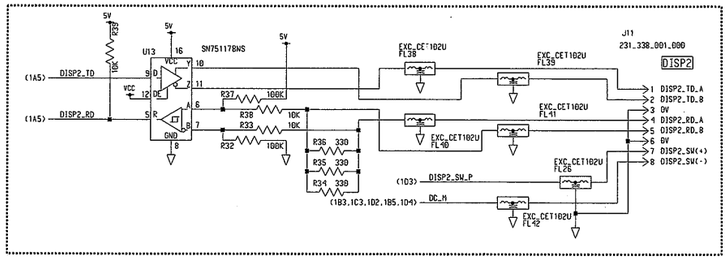
NOTE
*1: PATTERN ONLY.

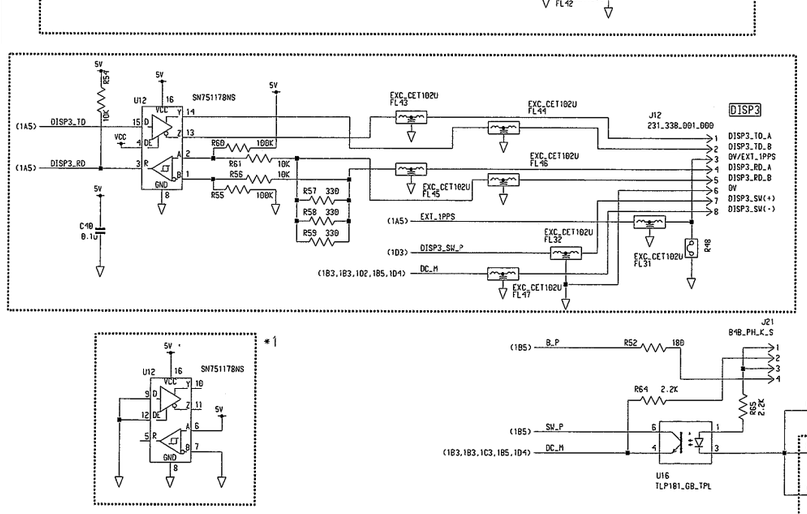
DRAWN 05/07/21 T.YAMASAKI		TYPE	24P0035 (5/5)
CHECKED Jul.22'05 T.Takeuchi		名称	MAIN基板
APPROVED Jul.22'05 A.Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	MAIN PCB
Dwg No. C4431-K14- A	REF. No. 24-006-5022-0		SCHEMATIC DIAGRAM

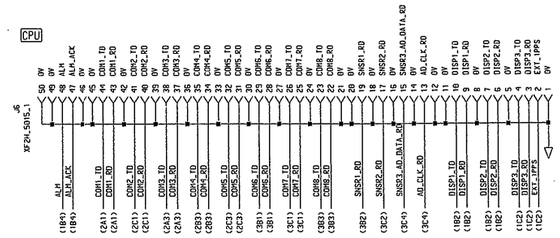


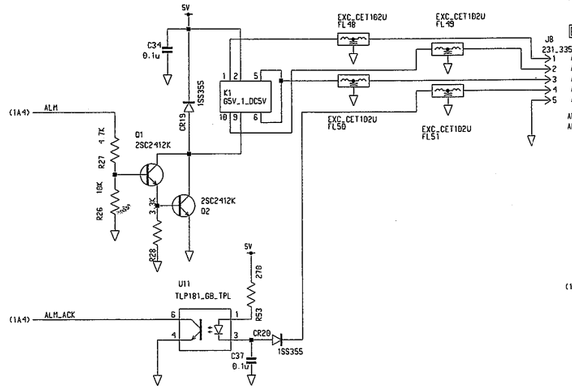


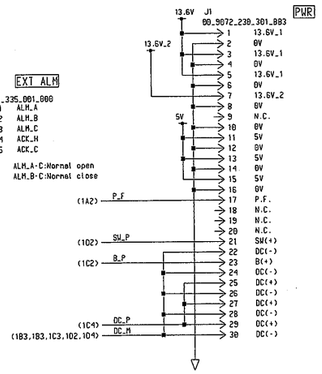


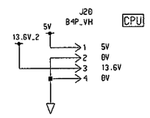


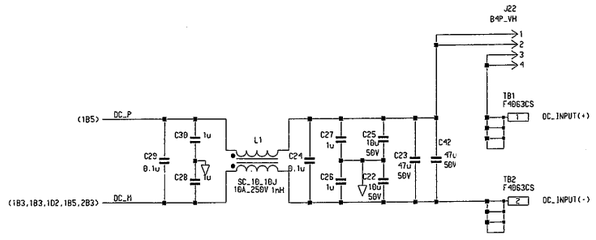


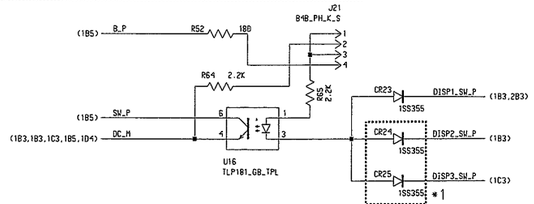








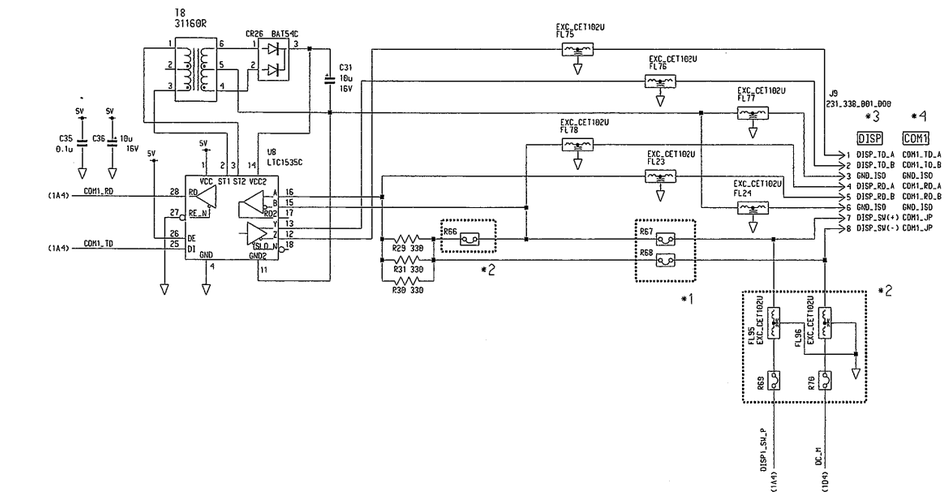


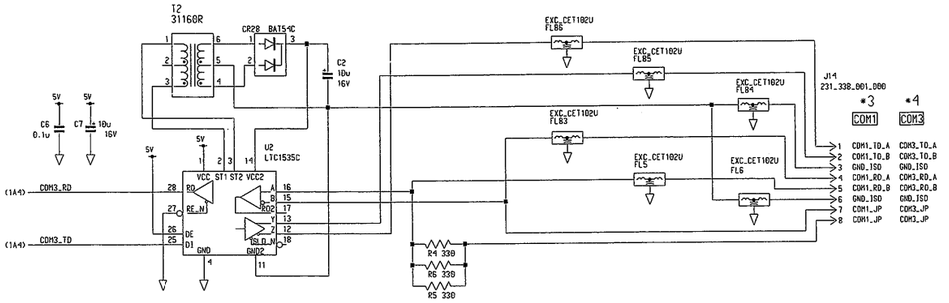


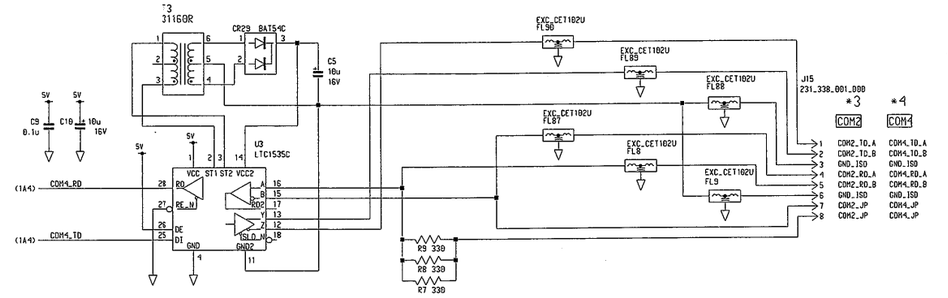
NOTE
*1: MOUNT FOR FA-2001 ONLY.

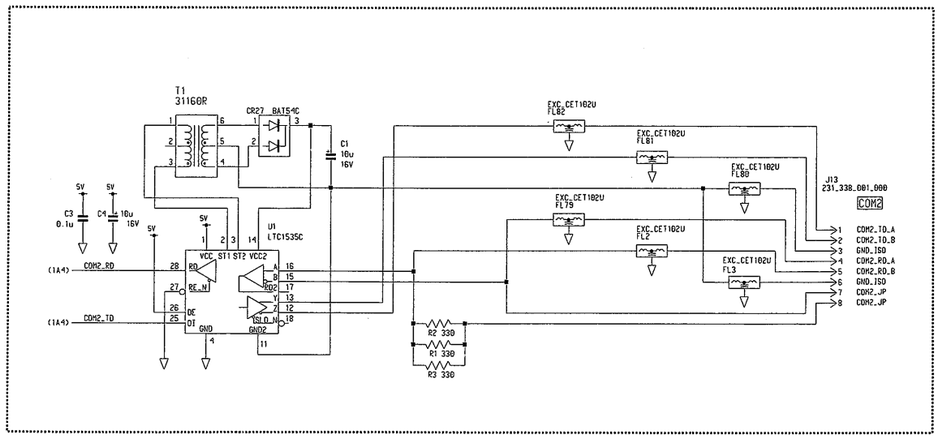
DRAWN 05/07/21 T. YAMASAKI		TYPE	24P0036 (1/3)
CHECKED Jul 22'05 T.Takeuchi		名称	MOT基板
APPROVED Jul 22'05 A.Ishiyama	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	MOT PCB
Dwg No. C4431-K15- A	REF. No. 24-006-5023-0		SCHEMATIC DIAGRAM

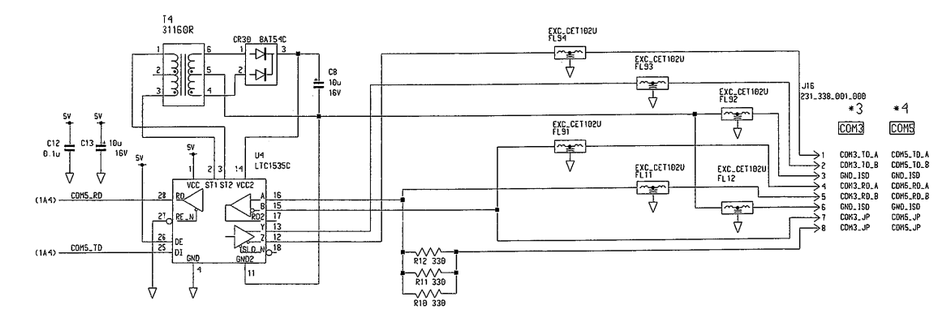
FURUNO ELECTRIC CO., LTD.





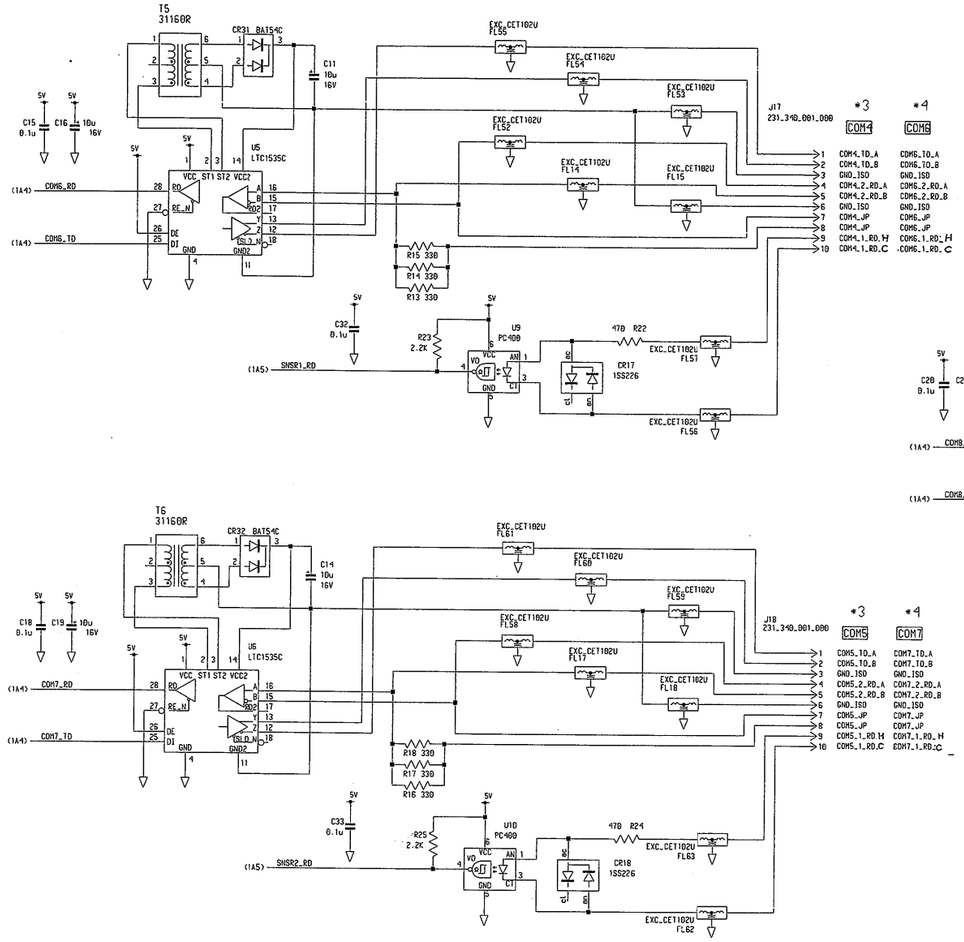






NOTE
*1: MOUNT FOR FA-2001 ONLY.
*2: MOUNT FOR FA-1501 ONLY.
*3: FA-1501; CONNECTOR NAME
*4: FA-2001; CONNECTOR NAME

DRAWN 05/07/21 T. YAMASAKI			TYPE 24P0036 (2/3)
CHECKED Jul.22'05 T.Takew			名称 MOT基板
APPROVED Jul.22'05 A.Hayashi		FA-150	回路図
SCALE	MASS	MODEL BLOCK No.	NAME MOT PCB
Dwg No. C4431-K16- A		REF. No. 24-006-5024-0	SCHEMATIC DIAGRAM

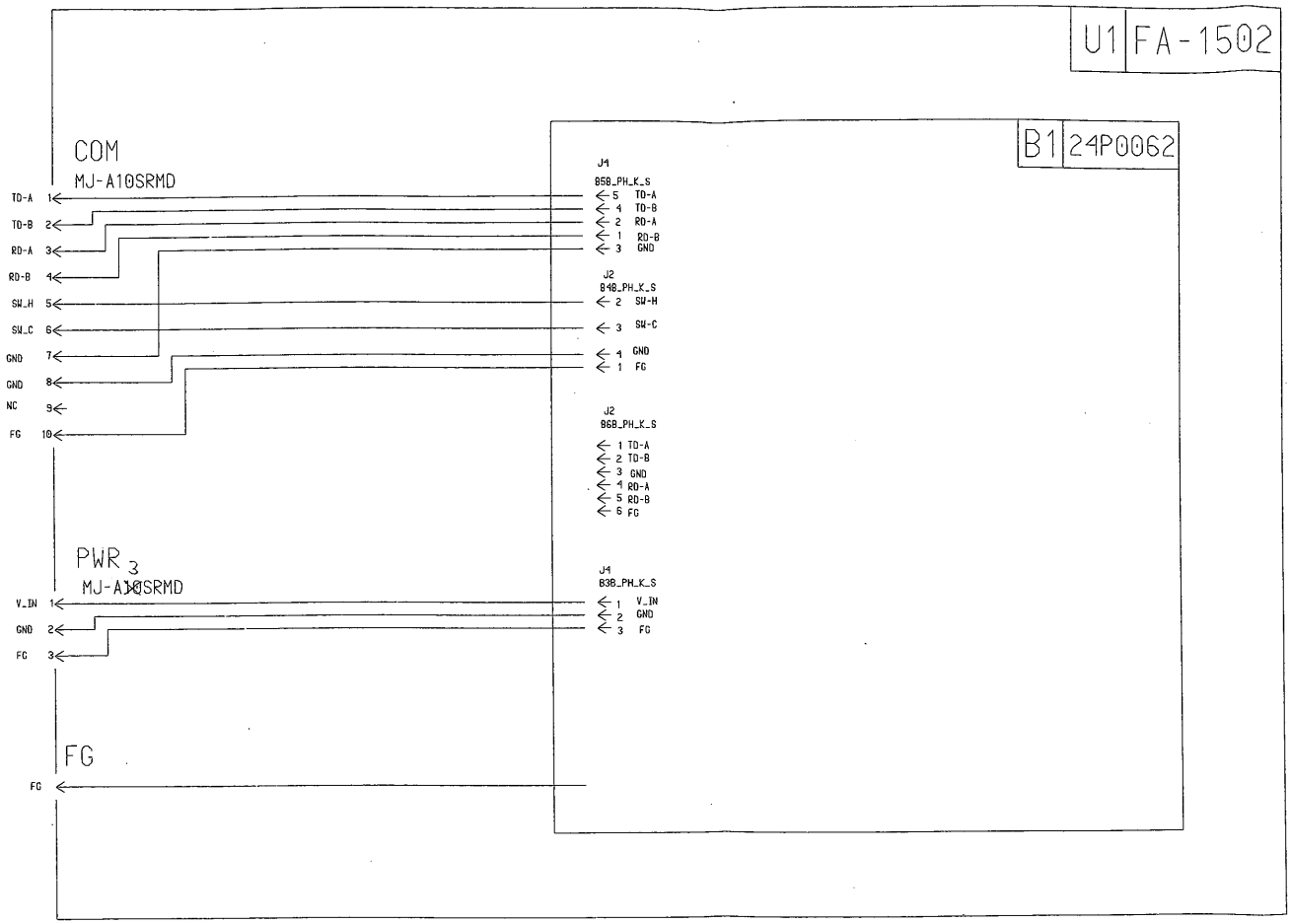


NOTE
*3: FA-1501; CONNECTOR NAME
*4: FA-2001; CONNECTOR NAME

DRAWN 05/07/21 T. YAMASAKI		TYPE	24P0036 (3/3)
CHECKED Jul.22'05 T.Takano		名称	MOT基板
APPROVED Jul.22'05 A.Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	MOT PCB
Dwg No. C4431-K17- A	REF. No. 24-006-5025-1		SCHEMATIC DIAGRAM

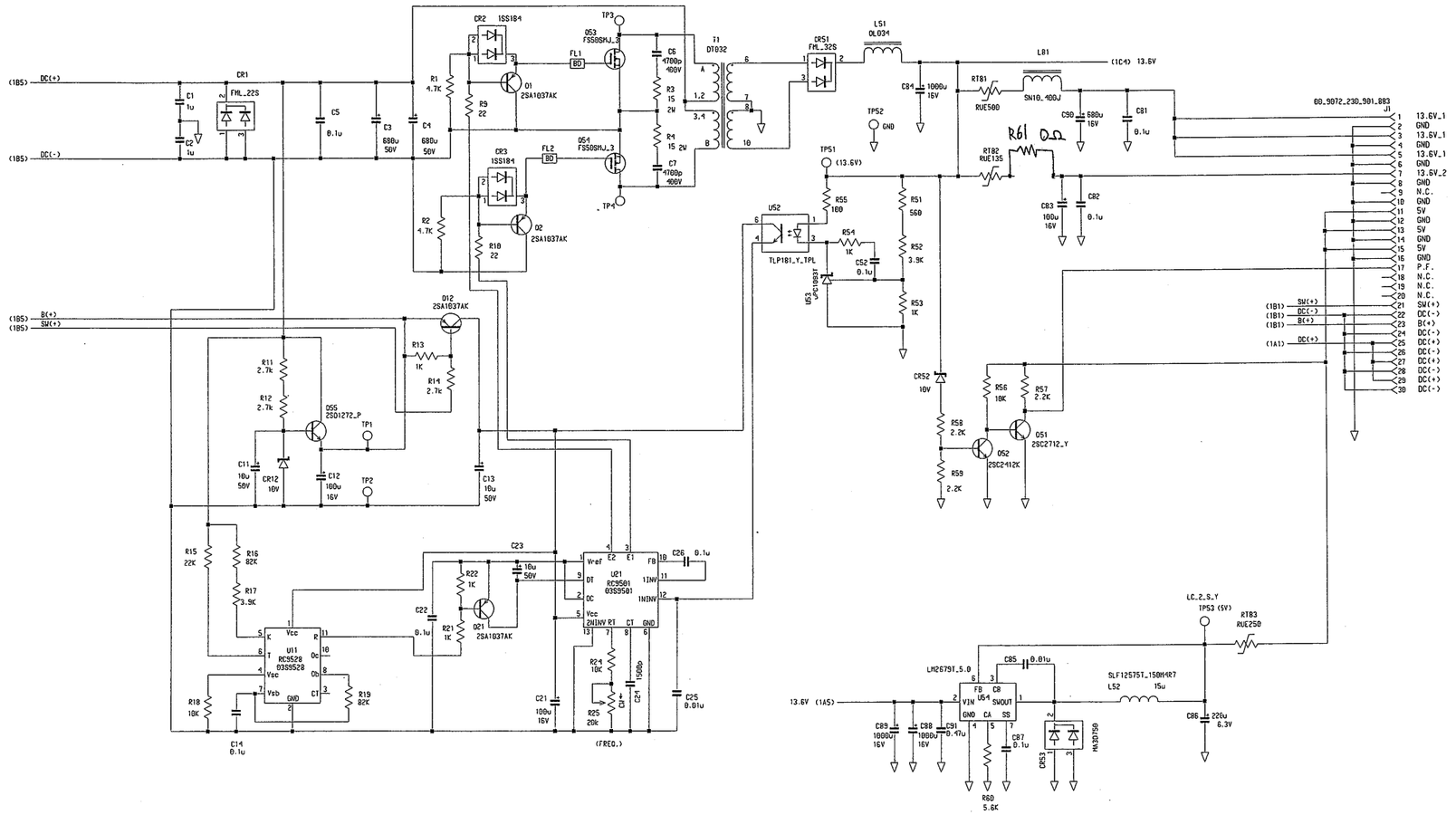
FURUNO ELECTRIC CO., LTD.

FURUNO



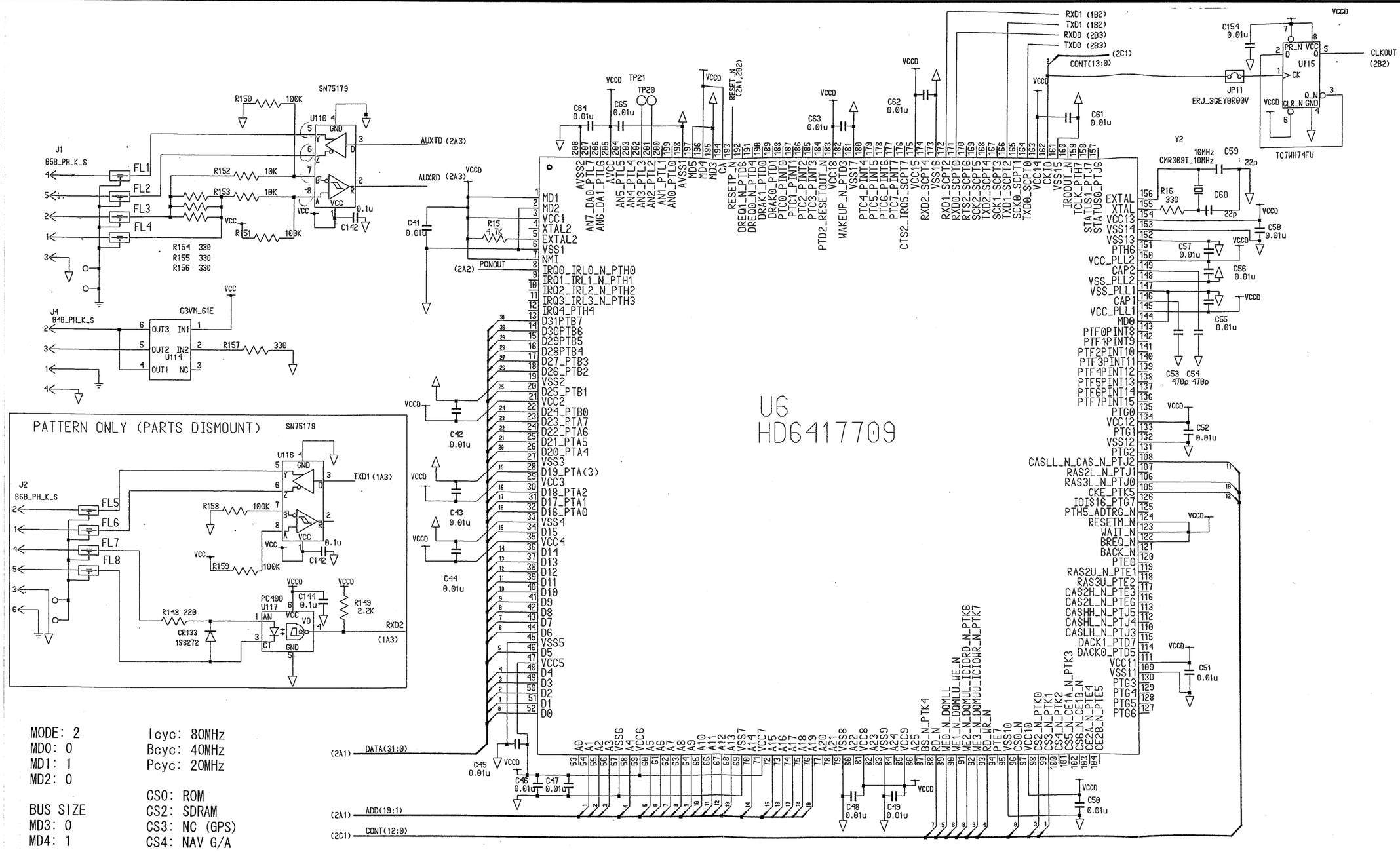
DRAWN 05/07/21 T. YAMASAKI			TYPE FA-1502
CHECKED Jul. 22 '05 T. Takeuchi			名称 表示部（総合）
APPROVED Jul. 22 '05 H. Miyashi		FA-150	回路図
SCALE	MASS	MODEL BLOCK No.	NAME DISPLAY UNIT (GENERAL)
Dwg No. C4431-K03- A		REF. No. 24-006-5027-1	SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.

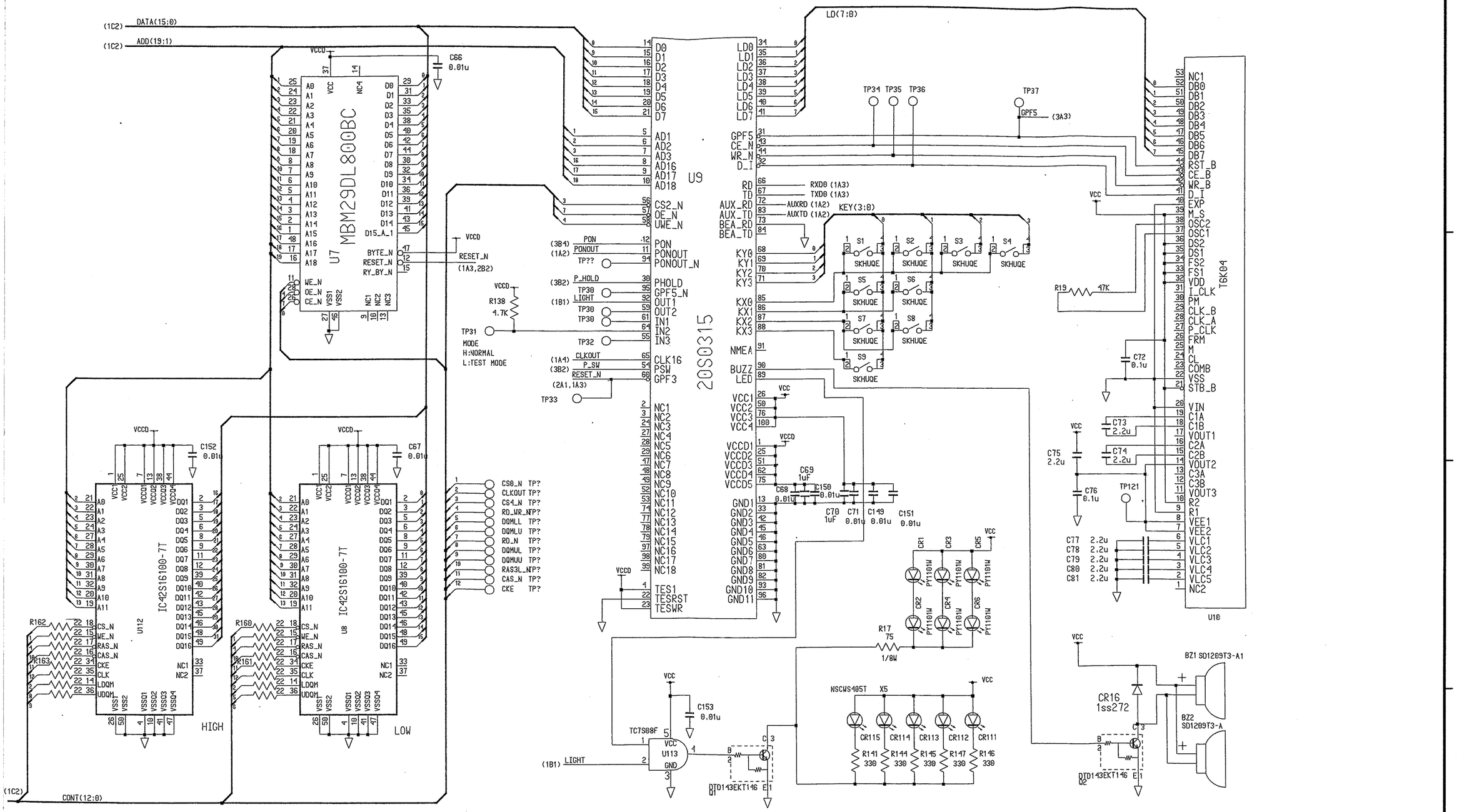


DRAWN 05/07/21 T. YAMASAKI			TYPE 24P0037
CHECKED Jul 22 '05 T. Takeno			名称 電源基板
APPROVED Jul 22 '05 M. Hayashi		FA-150	回路図
SCALE	MASS	MODEL BLOCK No.	NAME POWER PCB
Dwg No. C4431-K02- A		REF. No. 24-006-5026-1	SCHEMATIC DIAGRAM

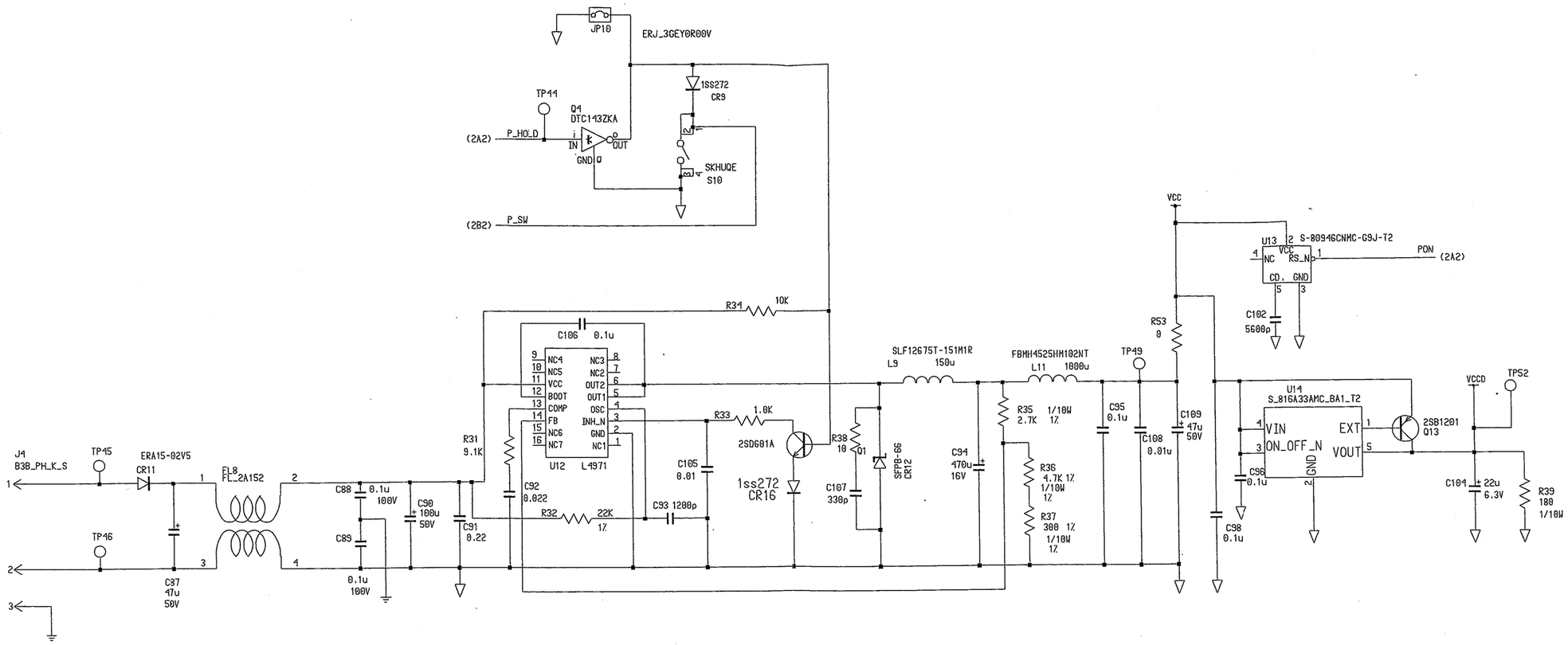
FURUNO ELECTRIC CO., LTD.



DRAWN 05/07/21 T. YAMASAKI		TYPE	24P0062 (1/3)
CHECKED Jul.22'05 T.Tokeno		名称	CPU基板
APPROVED Jul 22'05 H.Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	CPU PCB
Dwg No. C4431-K18- A	REF. No. 24-006-5028-5		SCHEMATIC DIAGRAM

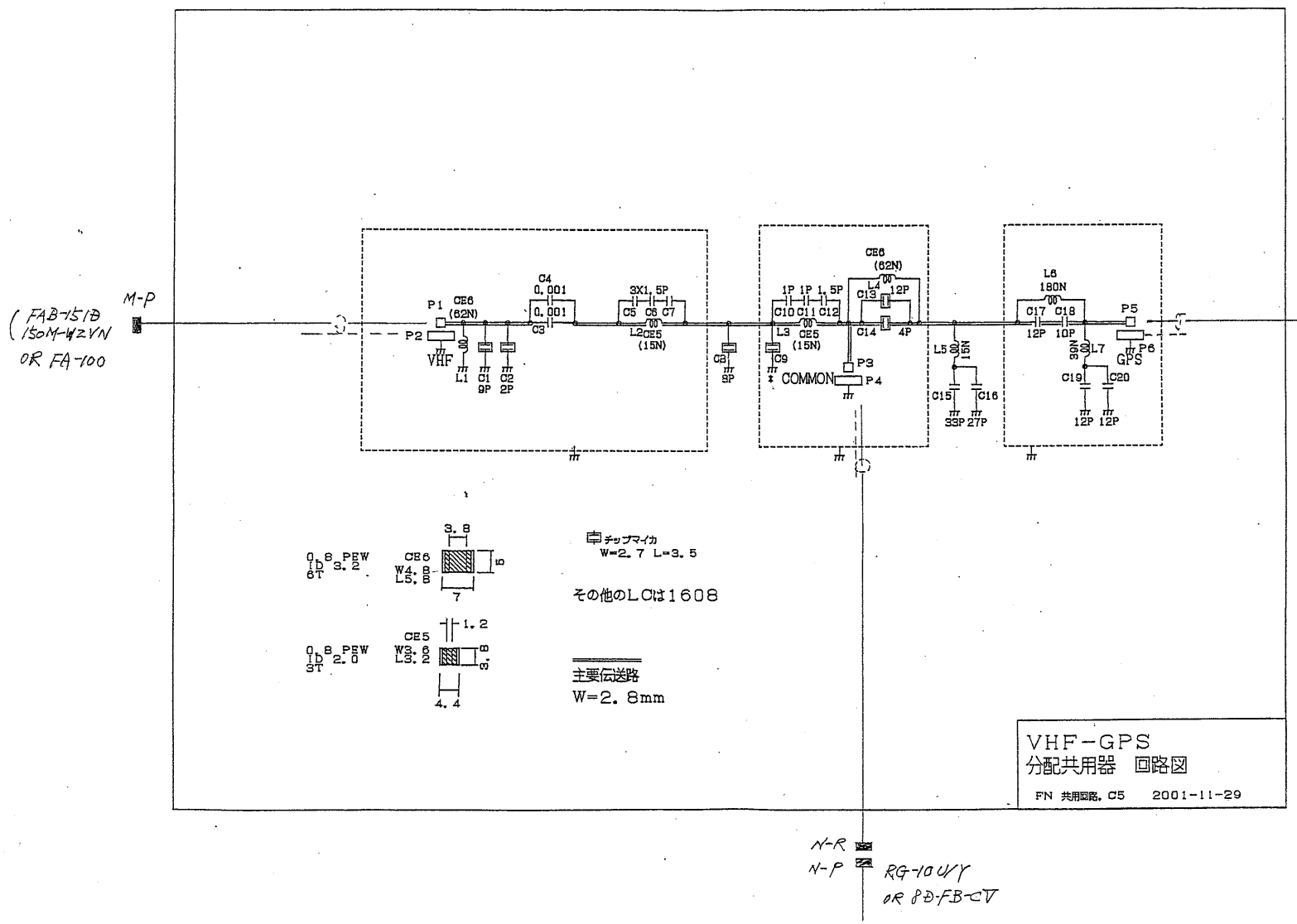


DRAWN 05/07/21 T.YAMASAKI		TYPE	24P0062 (2/3)
CHECKED Jul22'05 T.Takeuchi		名称	CPU基板
APPROVED Jul 22'05 H.Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	CPU PCB
Dwg No. C4431-K19- A	REF. No. 24-006-5029-2		SCHEMATIC DIAGRAM



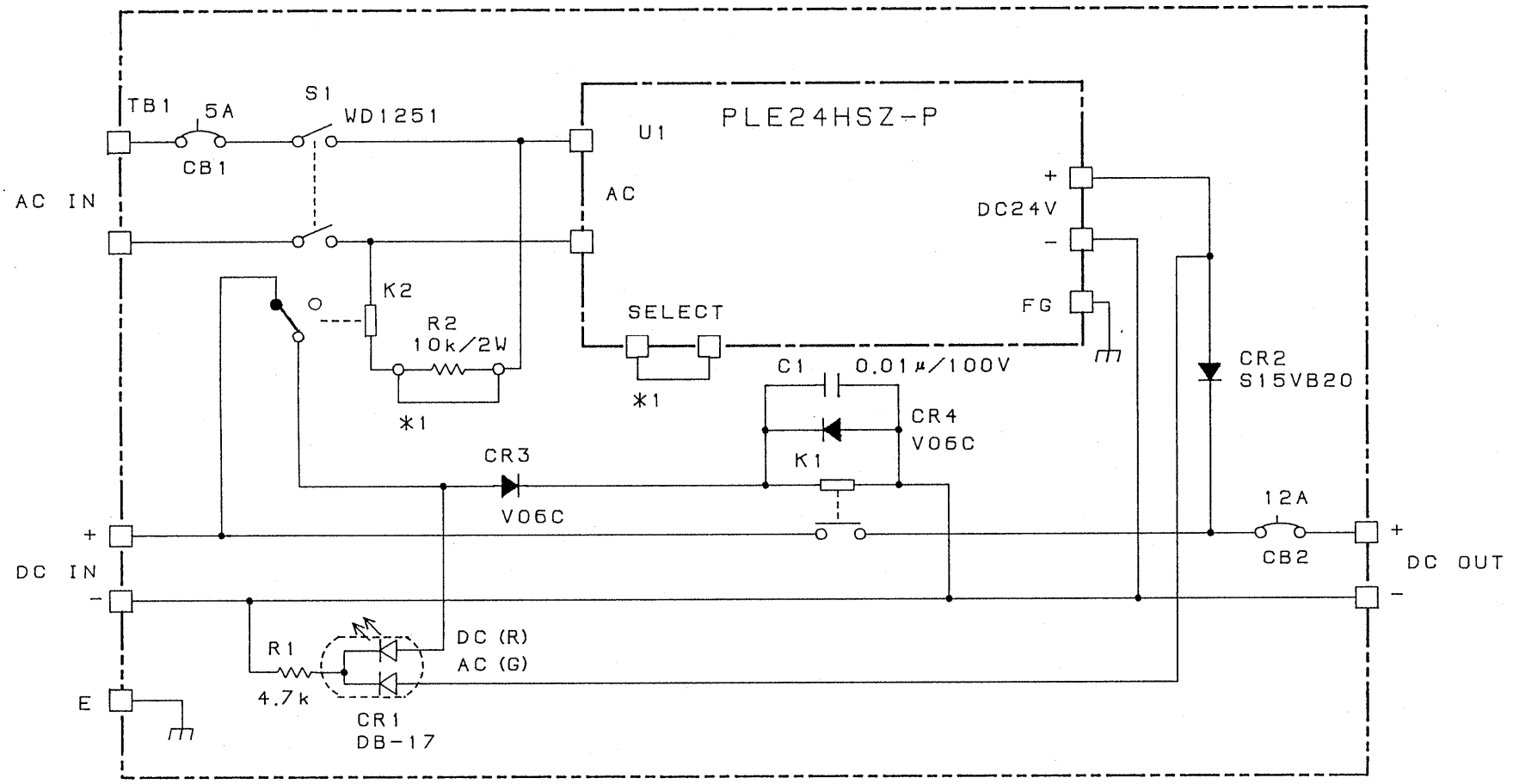
DRAWN 05/07/21 T. YAMASAKI		TYPE	24P0062 (3/3)
CHECKED Jul.22'05 T. Tokeuri		名称	CPU基板
APPROVED Jul 22'05 M. Hayashi	FA-150		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	CPU PCB
Dwg No. C4431-K20- A	REF. No. 24-006-5030-1		SCHEMATIC DIAGRAM

FURUNO



DRAWN 02/06/20 T. YAMASAKI		TYPE	DB-1
CHECKED 02/6/20 YKI		名称	分配器
APPROVED 02/6/20 YKI	FA-100		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	DISTRIBUTOR
Dwg No. C4417-K15- A	24-003-5025-0		SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.

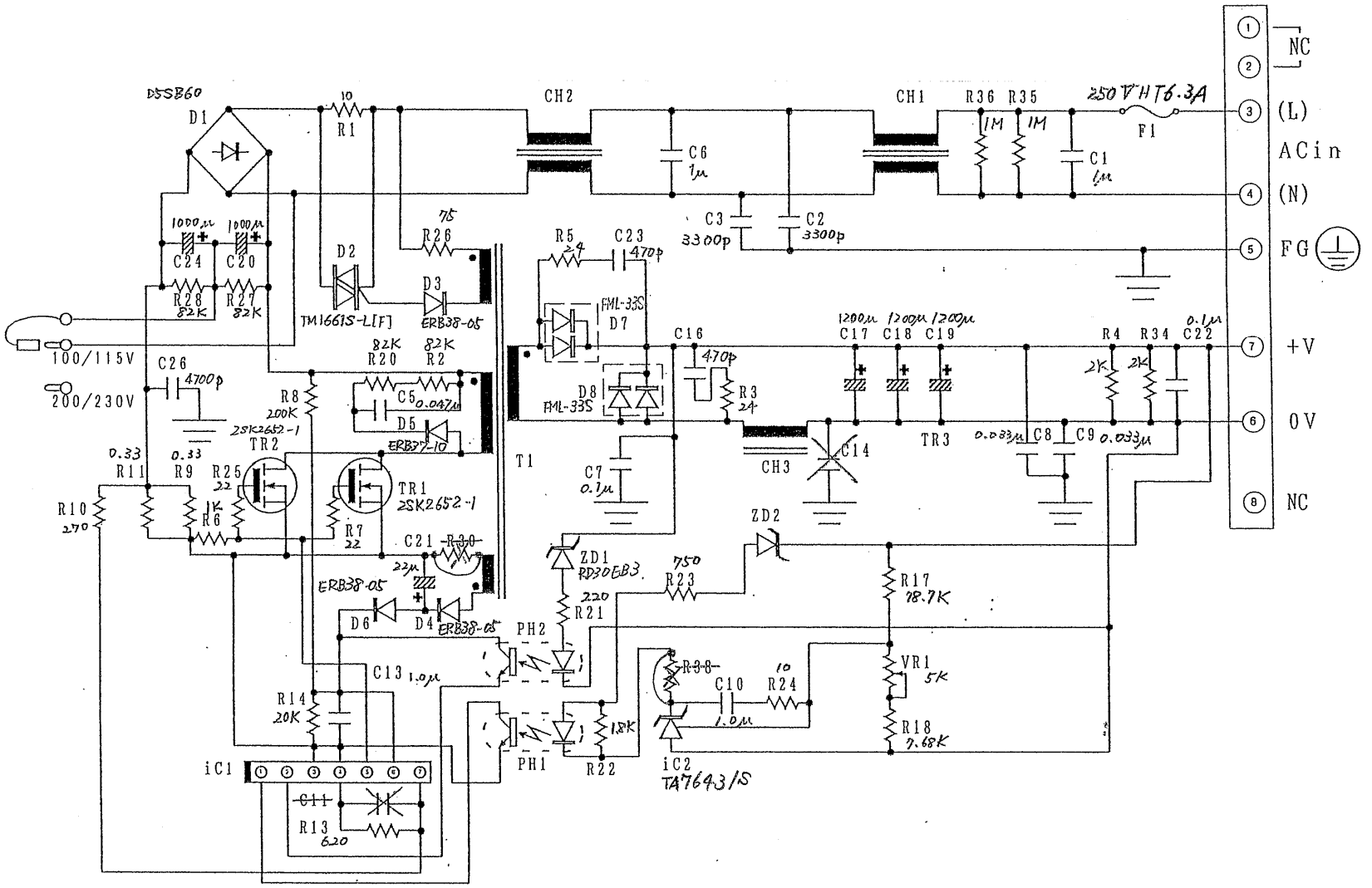


*1 : AC100V(CLOSE)
AC200V(OPEN)

DRAWN Apr 18 '97 T.YAMASAKI			TYPE PR-240
CHECKED Apr.22'97 K.Kusunoki			名称 整流器
APPROVED APR. 22 '97 H.Yamaguchi			回路図
SCALE / MASS kg	APPLICABLE TO; (MODEL)	BLOCK NO.	NAME RECTIFIER
DWG NO. C5003-K02- A			SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.

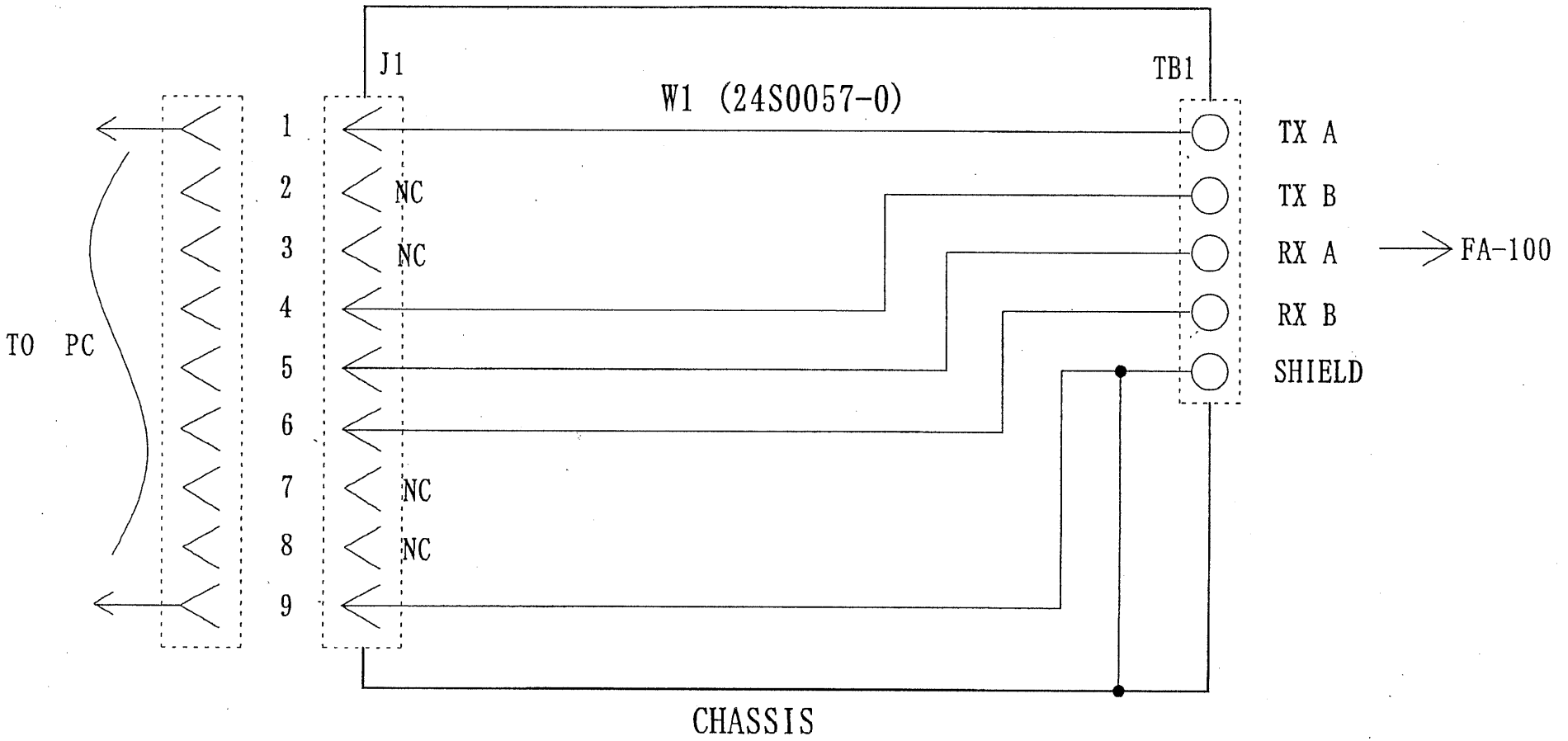
FURUNO



DRAWN 02/06/24 T. YAMASAKI		TYPE	PLE24HSZ-P
CHECKED 02/6/24 Y. K.		名称	変換基板
APPROVED 02/6/24 Y. K.	PR-240		回路図
SCALE / MASS	MODEL / BLOCK No.	NAME	PLE PCB
Dwg No. C5003-K03- A			SCHEMATIC DIAGRAM

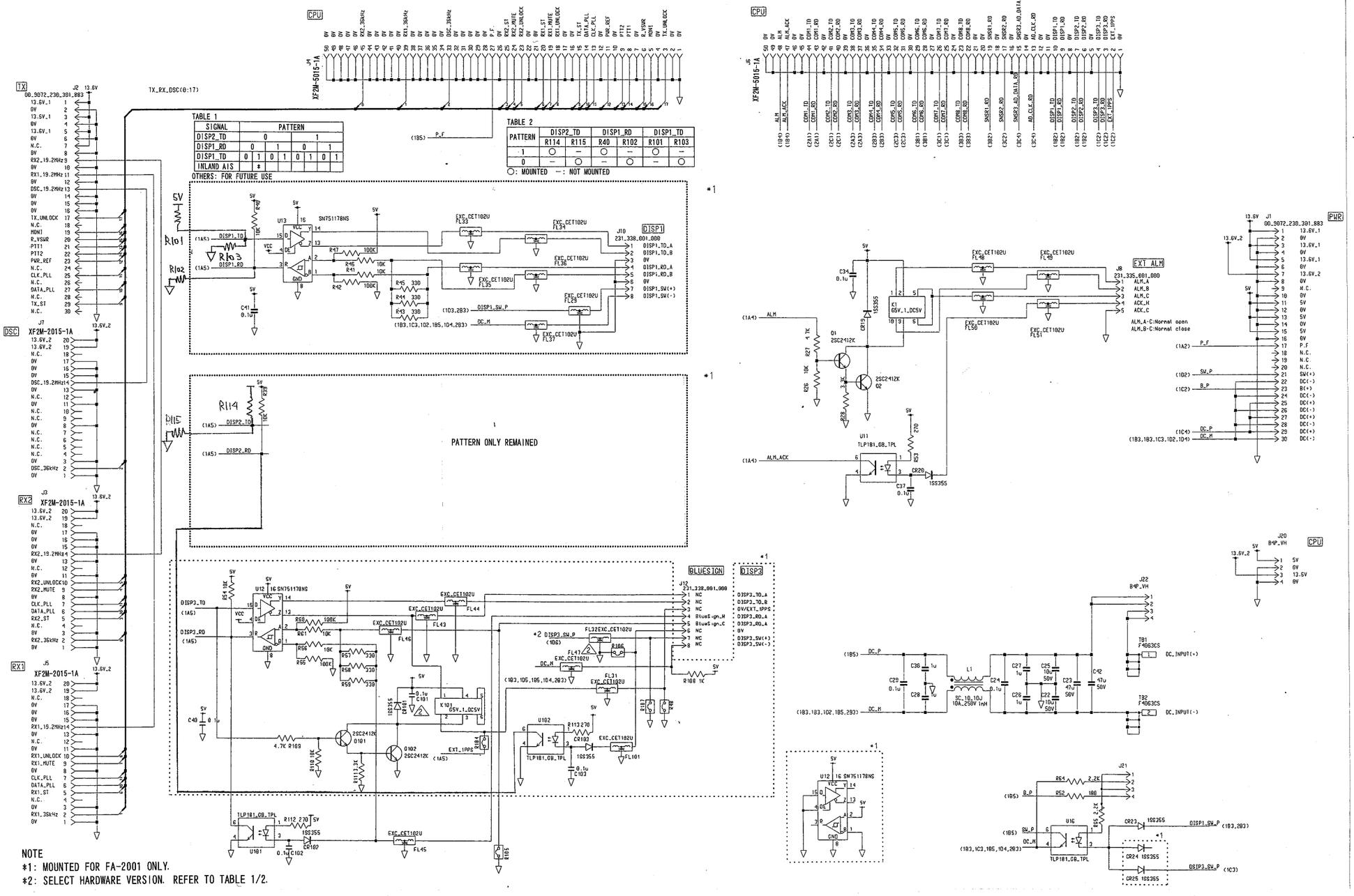
FURUNO ELECTRIC CO., LTD.

FURUNO



DRAWN 03/04/08 T. YAMASAKI			TYPE OP24-3
CHECKED 03/04/09 T. Takano			名称 パイロットプラグユニット
APPROVED 03/04/09 S. Yoshi		FA-100	回路図
SCALE	MASS	MODEL BLOCK No.	NAME PILOT PLUG UNIT
Dwg No. C4417-K18- A		OP24-3	SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.



DRAWN 10/01/27 T. YAMASAKI		TYPE	24P0036 (1/3)
CHECKED Sep.10 Takasu		名称	MOT基板
APPROVED 10.Sep.10 M.Kimura	FA-1501/2001 1 B2		回路図
SCALE MASS	MODEL BLOCK No.	NAME	MOT PCB
Dwg No. C4431-K15- B	REF. No. 24-006-5023-3		SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.